

RECORD



Bldg. 207

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1124.207

F. R. Fosberg

Collection and Field Note Book

No. 67  
(Feb. 15, 1963 - March 20, 1963)

(43404 ----- 43570)

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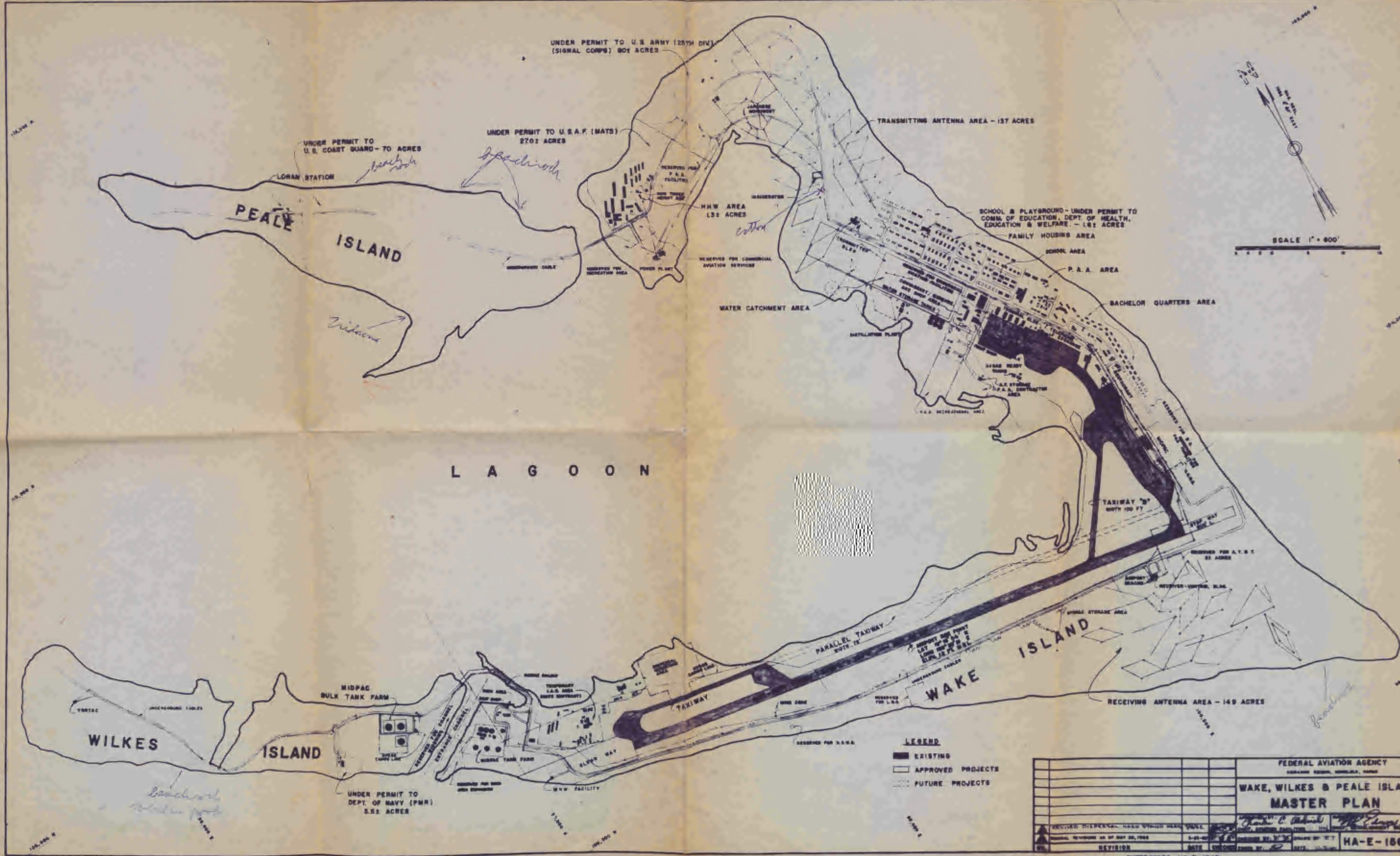
July 10, 2007

F.R. Fosberg  
field note book  
start with # 43404  
end # 43570



(a reward will be sent)





LEGEND

- EXISTING
- APPROVED PROJECTS
- FUTURE PROJECTS

FEDERAL AVIATION AGENCY			
WAKE, WILKES & PEALE ISLANDS			
MASTER PLAN			
REVISION			
DATE			
BY			
FOR			
HA-E-1061			

SUPERSEDES HO-E-1048



July 207



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Books # 67



Standard  
Signature Blank

PLANTS OF THE HAWAIIAN IS.  
OAHU

Lonicera japonica

Locality 2 mi. north of Turlock, Stanislaus Co., Calif.

Occurrence Planted many years ago in yard, has not spread but is a healthy plant in ~~area in orchard~~ ~~in yard~~

Date 3/19/63

Coll. F. R. Fosberg

Remarks Tangled climber, sterile at this season

Alt. 35 m  
No. 43553

return

c/o National  
2101 Constitution  
Washington 25, D. C., U.S.A.

(a reward will be sent)



Bldg. 207

UNDER PERMIT TO U.S. ARMY (25)  
(SIGNAL CORPS) 801 ACRES

DER PERMIT 1  
COAST GUAR

ATION

ISL

Zirkon

All labels in this book  
done except those on  
pages 6, 188, 190



F.R. Fosberg  
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Books # 67



## Standard Miniature Blank Book

No. 665 9½x6 120 Pages Units  
No. 667 9½x6 200 Pages Units  
No. 668 9½x6 300 Pages Units

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Books # 67



# Standard Miniature Blank Book

No. 665 9½x6 120 Pages Units  
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(a reward will be sent)



1903

California

1

Feb. 15 - Trip by car - Hayward  
to Turlock -

Hills bet. Hayward and  
Tracy are green.

In Tracy area apricot  
orchards in full bloom.

Feb. 16 - return to Hayward -

Area between Hughson  
and Ceres, but just south  
of each, is almost entirely  
a mosaic of orchards and  
vineyards - with a few  
open fields - with some  
cottonwoods, locust, Melia,  
Washingtonia, olive, evergreens,  
and Eucalyptus around  
houses.

Orchards are mostly  
peach, pruned to a very  
definite height, perhaps  
12 ft., with branches curving  
downward at tips. Grafts  
are either staked up and  
on wires or pruned back  
to erect trunks. There are  
some walnuts, either as  
orchards or rows along the  
roads.

Out of Modesto on Paradise  
Road - orchards dominate  
until Sunland (?). Here is a  
slough (or the Tuolumne R.?)



with large trees - most  
mostly Populus. Rhododendron  
very prominent.

From here a mosaic of  
open land and orchards  
probably generally more  
open land, till crossroad  
paradise - Rhiloh ads.

From here scarcely any  
orchards. On left  
sloughs & trees, much  
Rhododendron alternating  
with pasture & cultivation.  
Then low, dark gray  
soil. San Joaquin  
bottom lands. To it.  
higher, very open large  
fields all cultivated.

To Hwy 132 land is  
lower, drainage ditches,  
tendency to be marshy.

Left on Hwy 132 -  
all cultivation, ditches.  
3 mi. to San Joaquin R.  
becoming more marshy.  
to river. Along river are  
sloughs with trees -  
Salix, Populus, quercus? etc.  
Considerable Rhododendron.  
Marshy land mostly  
pasture.

West of river is both  
pasture & cultivation,  
all open. to Rt. 33. Rt.

on 33 to Tracy:

This land is higher, but  
possibly still originally  
marsh. One deep drainage  
ditch.

A few orchards toward  
Tracy - apricots, blooming.  
A young walnut orchard,  
just planted. A few rows  
of walnut trees along  
road. Mostly cultivation  
in large fields. Shallow  
roadside ditches. Area  
on it. 50 bet. Tracy & Rt. 33  
is low flat, all cultivated.  
Probably would originally  
have been marsh.

The rivers - San Joaquin,  
Tulare & Stanislaus  
are all flowing with  
considerable volumes  
of water, and are all very  
muddy - not overflowing  
in spite of heavy recent  
rains.

Center strip on it. 50  
mostly has a hedge of  
oleander.



Feb. 17 - St. Lucas Valley  
Partially denuded hills,  
with patches of woodland  
and, in western part,  
of chaparral. Flat  
valley bottom with  
thickets and patches of  
wood - Umbellularia (with  
noticeable weeping habit),  
Quercus (wislizenii?), Salix

5 km photos near head of  
valley - chaparral with  
Umbellularia in ravines.

Immediately over  
summit are *Pseudotsuga*,  
*Sequoia*, ~~*Pseudotsuga*~~  
these becoming abundant  
down the canyon toward  
Nicasia. *Arbutus*.

*Umbellularia*  
Esp. in valley bottom  
above Nicasia, where there  
is a beautiful grove of  
sprout redwoods.

Near Nicasia reservoir  
a slope, mostly grassy, has  
a series of large slump  
terraces - on the slumps  
are patches of *Cornus*.

In a wide ravine is a  
patch of *Salix* sp. with  
some *Rhamnus californicus*

*Baccharis filularis* is  
scattered on slopes.

Canyon below Nicasio Res.  
is densely wooded with  
*Umbellularia*. One local  
slope shows very striking  
grooved wind-shear. (photos)

Below this the valley  
bottom filled with fescue about  
4-5 m. tall, catkins just  
coming out. This and  
*Aesculus* are bare. The *Aesculus*  
is rare, scattered in the  
*Umbellularia*. Some *Quercus*  
*wislizenii*.

Fairly extensive salt  
marsh at head of Tomales  
Bay. Slope of Inverness  
Ridge above bay densely  
wooded. Much building  
along road, even out into  
salt marsh.

Point Reyes - peninsula bet  
Drakes Bay and ocean.

mostly grassy & pastured,  
rocky knobs north of lighthouse  
partly grassy, partly  
covered by a thin scrub  
of *Lupinus arboreus*  
(photos). Long strip of  
dunes to north back of  
beach, with *Lupinus* & *Baccharis*.



A little *Gaultheria* ~~sp.~~  
 in rocks, *Penstemon* ~~sp.~~

- In flower {  
*Hamamelis arctopoides*  
~~*Hamamelis*~~  
*Nemophila menziesii* v. *atomaria*  
~~*Hamamelis*~~  
~~*Claytonia*~~  
~~*Penstemon*~~  
~~*Phacelia insularis* var. *continentalis*~~  
~~*Trigonotis*~~  
~~*Arabis*~~ *Arabis blepharophylla*  
*Dentaria californica*  
*Berberis aquifolium* (pinnatis)  
*Erysimum*  
*Arnica discoides*  
*Oenothera ovata*  
*Phacelia californica*

In a sheltered slope  
 some sizable bushes  
 of *Berberis* in the *Lupinus*  
 scrub.

California

Feb. 17 - Point Reyes hills ~~in~~  
 north of lighthouse back  
 from coast. Marin Co.

43404

*Berberis*

"

very local on slopes  
 away from sea

1

05

*Phacelia insularis* var. *continentalis*  
 rare, in grassy places  
 around rocks on hilltop

stiff compact shrub 1 m. tall,  
 leaves stiff; flowers yellow.

flowers rose-colored



Feb. 22 - Arrived on Guam at about 9:20 a.m. The aspect of the island from the air is definitely green.

Superficial impressions from driving around central part of island: Tamarining, Agaña, Barrigada, College of Guam, Harmon Village, etc.

Leucaena - about as luxuriant as ever, but tips of upright branches or stems are bare, for up to 5-6 dm. a node, lines made.

Artocarpus - many trees have small branches beaten off and the aspect of the plant very ragged, but small leafy twigs appearing in abundance.

Ficus - branches beaten off, larger ones with an abundance of small sprouts. Many of the trees little more than the complex tangle with short sprouts.

Cocos most trees still standing, but looking very beaten up, a few snapped off, quite a few blown over. Some look as though they had been attacked by Anzotes, but this not conspicuous. Anderswald, agriculture dept. chief, said that although a few trees look this way no beetles have been found.

Ochrosia - many small trees seen but none seemed to show any typhoon effects. Fully leafed out.

Premna - only one tree noticed but this showed no signs of damage.

Morinda citrifolia - fully leafy, showing no obvious effects of typhoon.

Fibiscus - ornamental hybrids - leafy and blooming vigorously.

Hesperis propinqua - one or two small plants seen, fully leafy.

Herbaceous ground cover is fully as luxuriant as normally, especially



common components are:

Bidens leucantha, most conspicuous roadside species, flowering abundantly.  
Isoglossa hillebrandii, very common, flowering.

Chloris inflata common in grassy places. also Pennisetum indicum

Pennisetum setosum locally abundant in Harmon Field - Harmon Village area, fully covering ground.

Peperomia occasional, not showing any typhoon effects at all.

Pisonia <sup>grandis</sup> trees near hospital have all small branches broken off, sprouting abundantly from trunk and larger branch stubs. One tree lying down sending up sprouts.

Pandanus in forest mostly showing no apparent effects - fully leaved out. But in some patches of woods are many trees broken off.

The general aspect of the forest north of Harmon Field is ragged but certainly green.

Anderwald says that after the typhoon it rained hard for about 4 days.

Casuarina equisetifolia ragged looking, with tips of branches dead, but all large and medium even many small branches sending out small branches with abundant photosynthetic branchlets.

Delonix regia were defoliated but have recovered ~~for~~ partially to almost wholly.



acc. Stone -  
Not a leaf left after typhoon  
except palms + Pandanus  
which were shredded.

Leucaena started to  
become green again  
within two weeks.

Artocarpus was by far  
the slowest to start to  
put out leaves again.

Few Pandanus were either  
snapped off or tipped over,  
but some were.

Plants seen

Phyllodendron cf. bipinnatifidum  
Dombeya spectabilis  
Nopalea cochenillifera

Kuddeja asiatica - road  
below west gate of Nagasaki  
along ditch. fair colony.

range Senecio (from Hawaii)



Feb 27. Trip Agaña - Piti - apt  
- Umatac - Meigs - Inarajan -  
Talofofo - Yona - Sinajana - Agaña.

At <sup>Asan</sup> ~~Piti~~ a Casuarina with only a very slight development of new branchlets, others on landward side of Asan Point scarcely at all damaged.

Thespesia and other beach trees, incl. Pithecellobium defoliated, many tipped over. Refoliation not far advanced on Pithecellobium, but well advanced on Thespesia.

On Cabras Island Pluchea indica is abundant. P. odorata occasional, hybrid several colonies - depressed.

On seaward face of island in spray zone

- o Pluchea indica
- c Capparis cordifolia
- a Pemphus aciculata
- Pipturus argenteus
- o Callicarpa candicans
- o Achyranthes velutina
- o Spornoa peronnetia
- o Clerodendrum inornatum
- o Passerola tucada
- o Spornoa tuba

all on rough limestone but the Pluchea not only on

disturbed areas. Here also Fimbristylis cymosa abundant.

On exposed sloping face several m. above s.l. The plants were apparently cut down to woody bases, but are now ~~re~~ sending out new branches.

Panicum spontaneum one sterile clump on breakwater beyond end of Cabras (with the Pluchea)

Battered forest on limestone near base of Cabras with Xylocarpus, Thespesia, Pisonia, Artocarpus marian. Pipturus - all recovering vigorously - the Artocarpus slowest.

On ridge beyond quarry Pipturus is dominant, distal parts dead, vigorously sprouting from bases & trunks.

Beyond Cabras, toward Agaña, are thickets or forest of Pithecellobium, some trees toppled, most of them battered, but mostly well



leafed out.

Just river of fass

Mangroves - some killed - one area counted, of tall stems 1/2 live, 1/2 dead, these still standing.

Many have been knocked down and are dead. No mosquitoes.

A patch a little farther away seems mostly living. The leaves are mostly on the upper branches.

A small patch of mangrove at corner of Inner Apra Harbor are more alive than dead.

At Agat, but along beach some *Lumnitzera*. This dead but abundant small leafy branchlets. Breadfruit trees on coastal strip tipped over but sending out some branchlets.

Some on landward side of road standing but small branches mostly removed, abundant small branches.

Most of toppled trees pointing south, incl. a number of coconuts.

One coconut snapped off s. of Bangi point on flat at top of beach. Several partly, toppled *Pithecellobium* are partly dead, but many branches green and sending out tiny leafy twigs.

Facsi Point - rain-storm - waterfalls everywhere, from here south, water from sword-grass areas ~~are~~ very clear.

Coconut trees in valleys look very peculiar south to Umatae look very peculiar - many old leaves hanging on and small curved leaves.

At Merizo and east many *Artocarpus* knocked down, still sending out sprouts - also *Pithecellobium*. Trees in general here look battered but leafy. The mangroves very little affected.

Coconuts all have lower leaves partly brown. Some have inflorescences.



Small mangrove swamp east of Merizo. Trees to 3 m. completely unaffected by the storm.

*Rhizophora mucronata* + *Bruguiera gymnorhiza* about equally dominant both flowering, fruiting, but not abundantly. *Scaevola taccada* flat with several *Avicennia* seedlings.

The *Coscinaria* on the south coast is not nearly as battered as in the central part of the island. Probably still retains old green branchlets.

Many trees, especially *Pithecellobium*, are down but may be from 1957.

Near Agaña Pt., many more trees are broken and knocked down.

North of this some coconut down, but standing ones not much damaged. Young ones seem more tipped over than tall ones.

*Santana* is becoming abundant on flats between Agaña Point and Inarajan.

In Merizo bananas are a bit taller than elsewhere (to 2 m), one bunch of fruit seen.

Coconuts up along east coast are rather sparse and battered looking. None seen down except for a patch about half way bet. Inarajan and Talofopo where most of the trees are down, but possibly not.

Trees more and more battered toward Talofopo and especially on the hills just south of the bay where everything is ragged.

At Talofopo Bay the waves apparently knocked the *Hibiscus* and *Leucaena* down to about 5 m. inland from the road. These trees are putting out leaves again, even those that are down.

The *Nipa* along the stream is somewhat battered and brown, but not more than bent over. At Inarajan



it was even less damaged.

North of Talofopo in the next inlet much coral boulder size, was thrown up across the road. Much damage to trees.

Togeha - Casuarina forest along beach still standing but rather thin-looking.

Coconut plantations more and more battered northward, but hard to distinguish between the typhoon damage and previous bad condition of the trees.

Feb. 24 - above Harmon Field some *Occhrosia* rather battered and defoliated, recovering, some scarcely affected.

Notes on weeds - *Paspalum fimbriatum* is generally scattered around the island.

*Emilia javanica* is common on roadsides around south end of island.

*Bidens leucantha* is extremely common on roadsides and waste places, at least as far south as Talofopo.

None of the common weeds seem to have been adversely affected by the typhoon. Some may have benefitted.

Many *Pithecellobium* tapped over, but mostly sprouting green twigs.

*Alocasia macrorrhiza* - fully normal in appearance.

*Pennisetum purpurum* has become very abundant all over north and west parts of plateau.

(to p. 52)



- means  
ready to record  
+ means already  
recorded

Feb. 23 -

east of Merizo  
on sand flat just back of  
shore, dominated by *Paspalum*  
*distichum*

43406

(grass)

6

locally common

2

07

*Avicennia*

rare on wet sand

~~08~~

Feb. 23 - Harmon Village

1

08

*Gomphrena*

common weed in lawn

Feb. 23 - breakwater just  
beyond Cabras Island  
on coral gravel fill

6

+09

*Pluchea odorata* x *indica*

several clumps,

growing with both parents

1

+10

*Pluchea odorata* (L.) Cass.~~occasional~~ occasional

3

+11

*Pluchea indica* (L.) Less.

abundant

Feb. 24 - Tarague Beach

2

12

(algae)

abundant on rocks between  
tides

(Cladophoropsis

Entenomorpha

det Doty

1 m.

small tufts, culms ascending  
to erect.

0. m.

2 seedlings, less than  
70 cm. tall, ~~seen~~ only, seen.

90 m.

depressed; heads white.

4 m.

much branched,  
conspicuously depressed  
shrub; heads purple.erect shrub; sterile  
at this season. leaves grayish green.shrub 0.5 m. tall, erect.  
leaves bright green

0 m.



Feb 24 - Campanaya Bay  
Forest on slopes along  
road have many partially  
bare trees (photos). The  
terrace shows little  
evidence of recent damage  
but back of the depressed  
coastal area are many  
beaten down bare shrubs.

Along the coast to the  
north the front of the  
taller scrub appears  
brown (photos).

Below the cliff is a good  
"worm-algal" bench (photos).  
(tide going down, would be  
low in 2 hours at Apr 11.)

Photos of *Polysia tenuifolia*  
patch on terrace just back  
of cliff edge.

Scrub forest on the  
terrace is mostly  
*Mammia* in outer 50-75  
m. This is entirely  
browned, but many  
dead leaves persist.  
A few green branches  
in sheltered places.

Inland the forest becomes  
mixed with *Ochromia*,  
*Barringtonia asiatica*, *Aplous*,  
*Pandanus tectorius*, *Guernia*,  
*Pisonia*, *Cycas*, *Ficus* *prolixa* etc.

The *Mammia* is less  
damaged here, but still  
predominantly brown.  
Some trees of most kinds  
are down. The cycads  
have lost lower leaves  
but still have good  
crowns. *Ochromia* seems  
little damaged.

About 100 m from base  
of cliff *Tuphanea* becomes  
abundant.

Epiphytic *Synsphaeria*  
seems unaffected.

*Pisonia*, here as well as  
on the slopes, is very  
much eaten by caterpillars.  
Leaves are lacy.

*Ipomoea* (or *Stictocardia*?)  
and *Flagellaria* are  
common vines.

Outside this forest  
*Leavola* is killed  
back extensively  
from tips but bases  
and protected branches  
are alive.

The *Mammia* in the edge of  
forest is leafless and  
is dead from 70 to 100 cm.  
back. Some saplings  
dead to base, even where sheltered.



sample 1. "Worm-algal" terrace  
(photos of rims) (sample  
of rim rock) very  
well developed here,  
perhaps at mid tide.

sample 2. Some samples of rock  
surface between terrace  
level and inner part  
of notch - a rough surface.

4. Samples of rims of  
flat bottomed solution  
pools well above lit  
but in spray area.

Deposits of debris  
back 50-75 m. from  
edge of cliffs show  
that waves came over the  
10 m. cliffs.

sample 5. ~~for~~ rock surfaces from rough  
pitted limestone about 10 m. up cliff  
Along east coast road <sup>ex.</sup>  
*Pandanus tectorius* forests  
show little or no effects  
of typhoon except a few  
trees blown down at edge  
along road. Where there  
are *Artocarpus* *Elaeagnus*  
trees there are badly beaten  
up. Small branches have  
been whipped off. The  
cypres have no old leaves

## Tarague Beach -

Coconut trees are perched  
on root mounds  
and debris has been washed  
up to at least 100 m. back  
perhaps 150 m. back of  
shoreline. Some coconuts  
snapped off. But it  
is possible that some  
of the exposure of  
coconut roots dates  
back to 1957, as the  
roots are quite dry  
and old. Several uprooted  
Casuarina trees have been  
thrown up to 5 m. or more  
on the rocks. (10 m. <sup>levelled by</sup> <sub>R.F.A.</sub>)

At about low tide  
level is a small  
exposure of white  
reef rock rising ramp  
cut in a much greater  
exposure of ~~or~~ deeply  
pitted reef rock. This  
darkly stained by algae,  
deeply notched intertidally,  
with rough surface  
conformable to just about  
2 m. above m.t. This  
levels precisely with  
mushroom rocks and  
other exposures well  
out on the reef flat.  
Abrasive material abundant



enough on the lower ~~as~~ ramp to keep it white for a while, but *Enteromorpha* or *Cladophora* is gaining a foothold on prominences. At least a few inches of material has definitely been removed from beach, probably more and if the root mounds are contemporaneous, much more, at least a meter in places.

Forest back of beach is battered and defoliated.

Along the beach to the westward is a good example of the 11 foot bench, both against the foot of the cliff and especially around the bottom of a very large mushroom rock. This rock is the size of a small room, perhaps 5 m high, very deeply notched at the 11 foot level. It appears to be a fragment that at some past time fell from the cliff. Though at the time it was observed it had not rained for at least 12 hours, water was dripping

from the top of the notch. Small stalactites had formed and a heavy blue-green algal deposit where the water fell, showing that the rock stores an appreciable amount of water.

This rock ~~as~~ suggests that the 11 foot bench could scarcely have been a Pleistocene phenomenon, as the rock in which this notch was cut could scarcely have been in this position that long.

The 6 foot remnants, also, suggest that they were probably not that old, as they would be pitted much more deeply than they are and would scarcely preserve any aspect of a 6 foot surface.



Feb. 24 - Campanaya Bay

43413

*Spermacoce*

4

common along roadside  
in *Leucaena* thicket.

6 +14

*Ipomoea triflora* ~~triflora~~ trilobata L.common along roadside  
in *Leucaena* thicket.

3

15

~~*Fudinaria*~~ *Sargassum*common in tide pools  
on "worm-algal" terraces

6 +16

*Stenotaphrum micranthum*small patch on <sup>(Dum.) Hall</sup>10 m. terrace ~~under~~ in  
edge of *Mammea* forest, on  
rough limestone.

1

17

*Sporobolus*very local, on rough  
limestone just above  
spray zone

1

18

*Euphorbia*rare in pits on limestone  
terrace just above  
spray zone

1

19

1

20

20 m.

20 m.

Twining in bushes,  
flowers dull rose-pink,  
open at 10 a.m. closed at 12 noon.

0 m.

10 m.

prostrate, forming a  
loose mat.

5 m.

dense tufts, leaves  
glaucous beneath.

5 m.

milky; glands greenish

0 m.

0 m.



Feb. 25 - Lates Point,  
north of Pago Bay

Forested cliff and  
terrace -

Cliff had a full  
canopy of *Pisonia* and  
*Cynometra* - this was  
opened up by typhoon.

The cycad, very abundant  
here, was not defoliated  
though, acc. Stone, elsewhere  
they lost all their leaves.

*Momordia* and *Physalis*  
are abundant here now  
but were not ~~there~~ present  
before.

The *Pisonia* here  
has unusually long  
stipes. *Intsia* is very  
densely leafed out.

In the terrace many  
trees are still leafless -  
probably *Mammea*.



Feb. 25 - Lates Point, north  
of Pago Bay (College of Guam)  
Forest on steep limestone bluff

43421

*Achyranthes*occasional in forest opened  
up by typhoon

3 +22

*Morinda umbellata* var. *glandulosa*  
common

3 +23

*Clerodendrum inerme*  
occasional

1 +24

*Pyrosia lanceolata* (L.) Farw.  
common on trunks of  
Cycas and other trees

Feb. 26 - Y Piga Conservation Area.

in tangled forest of *Pandanus*  
and *Artocarpus*, badly  
battered by typhoon

8 +25

*Pyrosia lanceolata* (L.) Farw.  
epiphytic on tree trunk 1-3 m.  
from ground

1 26

*Taeniophyllum*

rare, epiphytic on tree trunk

2 27

*Asplenium*

occasional, epiphytic on tree trunk

4 +28

*Polybodium punctatum* (L.) Sw.

occasional, epiphytic on tree trunk

11 29

*Nephrolepis biserrata* (Sw.) Schott det.  
abundant in ground layer

80 m.

stems ascending

twining, tangled vines;  
flowers white.low shrub; flowers  
white with purple  
stamens and style.~~fronds~~ coriaceous

160 m.

elongate  
rhizome surrounded by  
a dense mass of  
fine roots, creeping on  
tree trunk; blade leathery.  
aerial roots pale green, flattened.  
flowers white.  
fronds thin, pendent.

large clumps, not  
forming very regular  
rosettes

fronds erect.

1976  
Garrett

to p. 42



## Data from air photos

Ritidian Point - Feb. 15 1963

The vegetation shows little or no evidence of disturbance on reasonably low oblique except for some possibly defoliated trees on the terrace below the road on cliff edge. This is not at all obvious. Beachwood strip to northeast of point seems more clearly visible in these oblique than in a vertical strip of same region taken Feb. 21. (VI 3086 24 Feb. 63)

These verticals, about 1/5000 show much more evidence of defoliation but no real signs of extensive breakage or windthrow. This strip is very clear.

The canopy trees very largely defoliated, understory not

01092  
JAP-01 45N 13-37N 149 51 E  
ground



## Vegetation types -

*Sonneratia* - generally the whole mass is bent over somewhat, to as much as  $45^\circ$ . The tips of the branches are leafless, the lower parts densely leafy with tangled stems.

*Hibiscus tiliaceus* forest tends to be blown in one direction and even more tangled than normally, leafy but less so than normally.

*Pandanus* forest -



Feb. 26 - 4 Pigea Conservation Reserve.

Large breadfruit (same one on a transect in 1967) and others in the neighborhood have lost all smaller branches (or where some remain they are dead but first & second, rarely third order branches are putting forth leafy twigs, these no more than a few cm long). Some Pandanus knocked down, broken just at or below the top of root cone.

Aglaia mostly bare, beginning to leaf out. Ochrosia shows little effect - has bright green leaves, few broken branches.

Canopy has been almost completely destroyed and a thick ground cover about 1 m. tall of *Carica* seedlings, *Nephrolepis biserrata* with scattered other plants - saplings of *Aglaia*, shrubs of *Martynia*, *Discololux*, *Triphasia*, *Eugenia*, vines such as *Lagellaria*, *Sporaea indica* (photos - first 8 & 9 w. underex.)

Many other trees knocked down, with many ~~of the~~ epiphytes on fallen trees and branches.

In small road running thru reserve, as it goes up the hill, in places the majority of trees have been knocked down, all pointing west or south of west. These include some large *Artocarpus*, some *Ochrosia*, many *Pandanus*.



from p. 34

- + 43430 *Martynus thompsonii* (Mun.) Froh.  
common in undergrowth
- 7 +31 *Mikania micrantha*  
common.
- 2 +32 *Dentella repens* Forst. f.  
common on bare hard red soil

Feb. 27 - Ritidian Point

at top of cliff, on limestone

- 5 +33 *Melothria guamensis* Mun.  
in open ground at side of road
- 3 +34 *Capricorn frutescens* L.  
common on edges of thicket
- 2 +35 *Wilstroemia elliptica*  
occasional on cleared roadside  
(seedlings common in forest)
- 4 +36 *Melothria guamensis*  
occasional in forest

same - on lower terrace

- 8 +37 *Ixora triantha* Volk.  
common in undergrowth  
in forest on limestone

same - on sand flat back  
of beach

- 5 - 38 *Portulaca*  
common

Feb. 27 - Northwest Field.

west side

- 3 39 *Spathoglottis plicata* Bl.  
occasional in open grassy roadside

scrambling, sparsely  
branched shrub, fruit  
reddish, aril white.

very prostrate, fls. white.

160 m.

vine; flowers white,  
fruit green, fleshy.  
shrubs 1 m. tall; flowers  
greenish white, fruit green.  
shrub 2 m. tall, with  
unpleasant odor when  
broken; sterile.  
vine, flowers white.

35 m.

shrub 3 m. tall, ~~forest~~  
bracts pale at base;  
fruit green, as many as  
6-8 in a head.

8 m.

2 m.

prostrate, fleshy,  
flowers yellow, petals notched  
at tips, stamens 10-14,  
flowers closing at about 10:30 a.m.

160 m.

erect, flowers magenta.

(to p. 48)



Feb. 27 - Ritidian Point

On slope to south all large trees are bare but the understory is fully green.

*Ficus* on rampart is bare, coming back slowly.

On plateau the canopy is very thin - *Pisonia* is busy from being eaten by insects. *Premna* is fairly leafy.

*Intsia* very leafy, also the two trees of *Kentia*, *Macaranga* is well leaved out. *Ficus* mostly still bare. Many other trees bare. *Pandanus* uncommon here, but seems in good shape.

Beach below Ritidian Point waves obviously washed up to base of cliff, breaking the *Tournefortia*, ~~so~~ young coconuts, etc. in the outer edges of the vegetation at back of beach. much debris in coconut grove, small trees bent over but few large trees down. Back of this on lower rocky ground the forest of *Hernandia*, *Ficus*, *Aglaia*, *Lepiota*, *Psychotria marianensis*, *Premna*, etc., badly

battered, but no trees seen down. *Pisonia* almost completely defoliated by caterpillars. *Mammea* completely defoliated or leaves dead.

General direction of fall a bending of trees is east to west (on north coast). (photos)

Denuded ground around old installation has

*Thunbergia*  
*Bidens*  
*Cenchrus echinatus*  
*Ipomoea pes-caprae*  
*Lepturus repens*  
*Timbristylis cymosa*  
*Chloris inflata*  
*Wedelia*

First terrace above the flat back of beach - canopy is destroyed - *Ficus*, *Pisonia*, *Mammea*, are almost completely leafless, *Pandanus*, *Ochrosia* not badly defoliated.

*Barringtonia* somewhat defoliated.

In understory - *Cycas*, *Aglaia*, *Triphasia* not badly defoliated. *Carica* coming up in abundance. Seedlings of *Barringtonia* also abundant.



Same terrace a bit south of Rutledge St.

*Photos and film all*  
*insect* *(beetle collected on leaves may be responsible)*  
 Ficus both defoliated, the *Pisonia* by insect, (beetle collected on leaves may be responsible)  
*Chrosia* & *Guettarda* not much defoliated.  
*Guamnia*, *Cycas*, *Trochodendron*, *Isora*, *Melaleuca*, *Cestrum* all in understory not badly defoliated.

*Ficus* in this area seems to have been defoliated, then put out bunches of ~~the~~ slender twigs 10-20 cm long, which have then been dried up and lost their new leaves and are largely dead.

Clearing about 1 km from tower - mostly a solid stand of *Bidens* with some patches of *Lebania cannabina*. Down on terrace at base the forest has a considerable proportion of defoliated trees. One *Heliconia* (?) straight down half way to cliff.

Amantes Point - a number of *Casuarina* blown down to west, near top of cliff. *Ficus* beaten up, defoliated, except in ravines.

Some *Pandanus* blown over locally, all either uprooted or broken in root zone - only one tree seen broken off above roots.

Numerous swiftlets around steep cliffs, overhangs, & caves.

A tremendous shaft drilled in the limestone just back of cliffs, connected with a cave or crack in an indentation in cliff.



Feb. 27 Amantes Point

- 43440 + *Hedyotis foetida* var. *marianensis*  
4 in thickets at top of cliffs

Feb. 27 - Ritidian Point

- 41 *Eugenia*  
rare in forest on rough limestone

Feb. 28 - Togcha Bay

- 42 *Euphorbia heterophylla*  
abundant in disturbed ground near road

Feb. 28 Ylig Bay

- 43 *Turbinaria ovata* ←  
Also *Tania tenella* Kuetzing  
plants cast up on beach

- 44 *Sargassum*  
plants cast up on beach

- 45 *Hedyotis*  
on rough limestone rocks in spray zone

- 46 *Phyllanthus amarus*?  
on rough limestone just above sea

Feb. 28 - Pago Point

- 47 *Physalis angulata*  
roadside

- 48 *Physalis lanceifolia*  
in cultivated ground

Feb. 28 - Pago Bay

- 49 *Euphorbia charnissensis* Bass.  
in gravel at top of beach

110 m.

shrub 1 m. tall; flowers white.

150 m.

small tree, sterile.

5 m.

erect, stems fistulose and weak, bracts yellowish at base, not at all red.

0 m.

Also *Turbinaria turbinatus*  
*Sphacelaria triluloides* Meneghini  
~~Ecol~~ *Ectocarpus*

0 m.

(great masses of floats from windrows at high tide mark)  
fleshy, corolla white, lobes narrowly oblong.  
(note long fruits).

1 m.

1 m.

40 m.

corolla <sup>pal</sup> yellow, green center surrounded by brown, anthers bluish.  
sprawling, sparsely branched herb; corolla white with green center, anthers bluish.

1 m.

leaves white beneath, involucre glands green.



Feb. 23 - Agaña Swamp  
 a number of fairly large trees uprooted along the south margin of the swamp. Trees fell to east.

Sinjajang: *Pithecellobium* trees badly broken, some uprooted.

~~East of~~ Pago River -  
 Small strip of *Nyssa* along banks of river - older leaves mostly either broken off or if still standing, almost dead. New ones coming. Strip of *Phragmites*, *Nyssa*, *Acrostichum* and *Rhizophora* + *Bruguiera* separated from W. bank has the *Nyssa* leaves broken and all the mangroves dead except a tiny clump near ~~the~~ highway that still have some leaves near the tops, one or two other trees still show some signs of life. Many of the dead trees are still standing, some broken off. Of still living trees at least one is *Bruguiera* and one *Rhizophora apiculata*. The west bank of this channel is a tangle of *Hibiscus tiliaceus*

mostly beaten down and half broken, ~~the~~ but very leafy.  
 (See photos of mangroves begin vol 3)

Shore of Pago Bay, about ~~middle~~ <sup>beginning</sup>, is a steep beach of small pebbles, lined on lower edge with *Paspalum distichum*, upper slope with old coconut trees, there are rounded root masses 0.5 to 1 m. high, packed with pebbles. Apparently these are the result of earlier typhoons, but there has been some minor excavation around these recently. The strip of dense *Paspalum* sod along the bottom of the storm beach is definitely pre-typhoon as are various *Scaevola* and *Turnerfortia* bushes that have tops battered and are sprouting from bases. There is some burial of bases of *Scaevola* at top of storm beach by loose pebbles, but not very significant  
 to N. 54



Notes on weeds (ctd)

*Mikania micrantha*  
has become widespread  
seen at Yliga, Sinajana  
Pago, Nimitz Hill.

*Bidens leucantha* has  
reached at least as far as  
Toogha Bay on east coast.  
At Yliga it is growing with  
*B. pilosa*. *B. leucantha* is  
not abundant yet <sup>even locally</sup> on this  
side much south of Yoha.

Where the two grow side by side  
they do not look conspecific.  
Leaf shape & margins are  
not the same, the *B. leucantha*  
being predominantly trifoliate  
and finely and bluntly serrulate,  
the *B. pilosa* 5-foliate, sharply  
serrulate, leaflets longer, more  
pointed.

*Heliotropium ovatum* var.  
*depressum* (but not very  
depressed) is a pioneer on  
gravel either exposed or  
deposited by typhoon - is  
very abundant.



1963 Guam  
(from V. 51)

The *Leucaena* here shows no more damage than in upland. Probably waves here had relatively little force. Some plant debris up to 11 ft. above water-line.

Pago Point - The *Leucaena* in exposed places is bare much farther back from tips, less to 2-3 m.

*Physalis lanceifolia* has white flowers with greenish center, bluish anthers. *P. angulata* yellowish flowers with greenish center ~~with~~ bordered with brown, bluish anthers.

Yona - Most larger trees except a few coconuts have been badly battered and trimmed back to larger limbs.

Ylig Bay - broad sand flat back of beach - a thin layer of sand has been spread over this. Waves have washed inland almost 200 m.

Part of this was covered by *Leucaena* scrub, which has been bent inland. Bare sand has a good stand of *Stachytarpheta* in flower. Locally *Phragmites* must be coming up through a layer of sand probably from a buried layer of rhizomes - culms very slender, less than pencil, to 2 m. tall, beginning to flower. (Photos of bent down *Leucaena* scrub).

Beyond Tojcha River - *Casuarina* groves on sand flats back of wide beach - The sand over the rough limestone terrace - one part has had more sand piled on it - some trees broken, some bent inland, mostly some sand has been removed (photos).

Patch of *Leucaena* almost completely destroyed, a few sprouts from base (photos).



In the tallest casuarinas forest a foot or so of sand has been removed, exposing white rather rough limestone. On this an abundance of *Wedelia* seedlings, some *Sporobolus per-caprae*, some *Euphorbia chamissonis*, some *Lepturus* and a broad-leaved grass.

*Scaevola virgata* in sand pockets. (photos) *Calliandra*.

On sand pioneers are *Scaevola*, *Wedelia*, *Thunbergia*, *Sporobolus per-caprae*, *Lepturus*.

Casuarinas on the rock flat have root systems extensively exposed. Trees look battered but recovering. Some on sand have been blown down. Some broken off.

*Tournefortia* battered, some blown down but sprouting (photos).

*Hibiscus tiliaceus* blown down to almost prostrate but leafy (photos).

Beyond Jones Beach an area of forest of *Artocarpus*, *Fernandina*, *Landanum*.

is very battered, only main limbs of *Artocarpus*, *Fernandina* left, sprouting leafy twigs in abundance, esp. the *Fernandina*.

Coronite Bay Cove beyond this just before going around point to Talofos, has much boulder rubble but this must come from road upmap. (photos). A beautiful crescent beach (photos) with curved beachrock. Traces of 3 terraces and notches on point.

Yppan

On point is open scrub forest of *Barringtonia asiatica*, *Quettaria*, *Tournefortia*, *Thunbergia*, *Hibiscus tiliaceus*, *Cycas*, battered almost still leafless. The *Tournefortia*, *Cycas*, and *Thunbergia* are coming back fastest.

Shrub layer of *Calliandra*, some *Capparis*, etc. still almost intact, incl a little *Allophylus* & *Eugenia remwardiana*.

The amount of washed debris piled in this forest shows



That waves surely came  
over it, perhaps 10 m. above  
sea.

Trees for about 1 m. are  
dead on all the trees.

Mammies on bluff  
back of road is brown,  
almost leafless.



## Ornamental &amp; fruit trees.

*Cocos nucifera*

Few trunks snapped, more trees uprooted, but a very small percentage. Very many have broken leaves still hanging vertically. Almost none have any nuts, even small ones remaining, though new inflorescences are beginning to appear.

*Delonix regia*

Smaller branches are dead at tips, new foliage appearing in abundance, shape is generally preserved. A few are uprooted or partially so.

*Samanea saman*

Defoliated but new leafy twigs are coming out on all but the smallest branches. Shape preserved very well.

*Hibiscus hybrids*

So completely recovered that it would be difficult to know that anything had happened.

*Verticillium merrillii*

Shows no apparent effects of typhoon.

*Cassia fistula*

One tree seen, this badly broken.

*Plumeria rubra*

Temporarily defoliated, but no other effects except some trees partly tipped over.

*Adenanthera pavonina*

One tree seen - defoliated but recovering without apparent damage.

*Tectona grandis*

Small and medium branches torn off but trunks ~~and~~ and large branches sending out abundant vigorous leafy branchlets.

*Phyllanthus acidus* (9 - 10-12 pairs of alternate ovate glabrous leaflets) almost completely unaffected by storm.

*Persea americana*

Smallest twigs dead, only.

*Annona squamosa*

No apparent effects on small tree.



*Casuarina equisetifolia*  
Generally stood up well -  
lost smaller branches and  
all of the needles, putting  
out new ones in abundance.  
Where on shallow sandy soil  
some tipped over. In Brown yard one uprooted  
or broken off - one 3 dm. dbh.

*Artocarpus altilis* and *manihot*  
Generally lost all medium  
and smaller branches, and very  
slow to put out new leafy  
twigs. Some large ones tipped  
over. ~~These~~ Root systems  
of those tipped over are very shallow.

*Cassia exilis*  
Green but branches  
more or less broken off.

*Mangifera indica*  
small branches broken <sup>cut</sup> off,  
many leaves on main branches.  
Others with dead smaller branches,  
leaves on large.

*Erythrina variegata* v. *ovulata*  
Leafless but putting out new  
leaves, not obviously damaged.

*Cecropia*  
Some branches broken off.  
no leaves.

*Roystonia oleracea*  
few leaves left but  
otherwise intact.

*Carica papaya*  
most large trees are  
broken off part way up  
and are sprouting from  
the stump.

*Terminalia catappa*  
all branches broken off  
but now sprouting,  
sprouts are up to 1.5 m.  
4 internodes.

*Pithecellobium dulce* -  
many trees broken  
and uprooted, but sprouting  
vigorously.

Citrus - some tipped over,  
some rather burnt back  
from tips, some not much  
burnt.

*Musa* spp.  
~~these~~ shoots were killed  
to ground, but now are  
mostly 1 m. or more tall,  
one or two seen with bunches  
of young fruits.



Mar. 1 - along east coast road

Mixed forest with  
*Artocarpus*, *Pisonia*, *Pandanus*, *Ochrosia*, etc.

Badly battered, canopy  
 almost destroyed, many  
*Pandanus* knocked down,  
 broken at or below the  
 top of the root zone.

*Artocarpus* bare except  
 for clumps of new leafy  
 twigs on limbs and larger  
 branches.

*Mammea* - rather  
 small trees, mostly  
 defoliated but with some  
 green leaves still, not  
 brown as on cliffs.

*Mimosa citrifolia* seems  
 scarcely to show any  
 effects. *Ochrosia* in  
 very good shape.

Cycads abundant here,  
 many up to 5 m. tall, all  
 have a rather sparse  
 crown of leaves.

*Pisonia* with leaves badly  
 eaten - perhaps by a green  
 geometrid caterpillar (collected)

*Chorizanthe* and *Guamnia* are  
 partially defoliated but  
 recovering.

Locally more *Pandanus* down

than standing - many  
 uprooted

Large *Intsia* (photo) and  
 small *Pisonia*, as well  
 as *Ochrosia*, seem severely  
 affected by storm.

Ground is covered by  
*Nephrolepis* and some *Polypodium*  
 *scolopendria*. Small patches  
 - tufts of *Pennisetum petoselinum*.  
 One *Terminalia catappa* at  
 edge of wood seems scarcely  
 affected.

*Momordica* is very  
 abundant at edges of forest  
 and in openings and  
 here and there generally.

A series of low photos of this  
 forest (to about no. 32 on roll 3). Kod-  
 first 6 on roll 3.)

Across road the land  
 has been cleared with a  
 bulldozer, leaving a  
 few trees, mostly *Artocarpus*  
 standing. These were  
 badly hit by typhoon,  
 many knocked down -  
 all pointing south.

(Photos low - end roll 3, (dod.))  
 Soil here is thin & bright  
 red, friable.



## Anao-Mats Reserve

Canopy of forest completely destroyed. Many trees down. Locally Pandanus is broken off above root crown, generally below, or uprooted. Ochrosia either uprooted or scarcely affected at all.

Justicia uprooted, also Hibiscus tiliaceus either ~~to~~ bent down or uprooted. Pemna broken off. Ficus standing but small branches gone - tufts of leaves on larger branches.

The forest generally is a great tangle, many trees down. Several Marmonia broken off. More Pandanus down than standing. Many broken off above root crown.

One large Lathyrus dubius seen - broken off above root crown.

This forest about as hard hit as anything seen on island so far. Bidens leucantha very abundant in paths and openings.



Mar. 1 - east of Barrigada on  
East Coast Road.

43450

*Boerhavia*

4

in open bull-dozed clearing

5 + 51

*Polygala paniculata* L.

common along roadside

5

52

*Achyranthes*

common in edges of thickets  
and in cultivated ground

Mar. 1 - 2 miles northeast  
of Campanaya along East  
Coast Road

3

53

*Cyperus ligularis* L.

occasional along road  
in edge of forest.

Mar. 1 - plateau back of  
edge of cliff between  
Anao and Mati Points

7

+ 54

*Hyptis spicigera*

common in semi-cultivated  
ground

1

55

*Taeniophyllum*

common on fallen trees

3

56

*Citrus ~~bengalensis~~*

rare in forest along trail

Mar. 2 - road from Nimitz Hill  
to Mt. Alutorn & Mt. Tenjo

5

+ 57

*Lorophium halepense* (L.) Pers.

common locally on roadside

120 m.

prostrate, stems red; leaves  
dark green above, white beneath,  
flowers pink.

roots with wintergreen odor;  
flowers white.

spawling sparsely  
branched herbs.

160 m.

160 m.

plant erect, aromatic, to  
1 m. tall; corollas blue.

roots green, flattened to trunk.

small tree; fruits immature,  
spherical, aromatic, said  
to be inedible but used  
for washing hair.

260 m.

small tufts, erect.



## In Guam Market

*Ipomoea*

*Solanum lycopersicum*

*Allium cepa* var. - fruit

*Capricorn frutescens*

*Cucurbita* (manoa, habba)

*Curcuma boninensis*

*Citrullus*

*Ipomoea batata*

*Arec*

*Phaseolus vulgaris*

*Vigna sesquipedalis*

*Solanum Melongena*

*Lactuca sativa*

*Eugenia*

*Raphanus sativus*

*Colocasia* (los. - arrow)

*Ipomoea aquatica*

*Prothocarpus tetragonolobus*

*Beta* (chard)

*Musa* (fl. heads)

(cut up and cooked with meat)



Mar. 2 - Cotal Conservation  
area, east of Apra Heights  
in savanna on hills of  
red volcanic soil

43458

*Thelypteris*

3

in small wooded ravine

H

59

*Timonius*

common, edge of wooded ravine

1

60

*Timonius*

common

1

61

*Timonius*

common

1

62

*Timonius*

common

2

63

*Timonius*

common

1

64

*Timonius*

common

4

65

*Timonius*

common

5

66

*Melastoma*

very common

2

+67

*Glochidion marianum* M.-A.  
occasional

2

+68

*Treyinnetia mariannensis* Merr.  
rare

160 m

shrub 3 m. tall, fruit green.

shrub, fruit green.

shrub, fruit green.

young plant 0.8 m. tall, sterile.

shrub, sterile.

sapling, sterile.

shrub, ripe fruit black.

shrubs 0.5-1 m. tall; flowers

white, bracts subulate

to narrowly boat-shaped.

shrub; flowers yellow.

vine, climbing, closely adherent  
to Pandanus tree. fruit reddish  
when ripe.



Mar. 2 - Cotal Reserve

No apparent unusual erosion or enlargement of erosion scars result of typhoon. Any difference would only be detected by careful measurement.

Much damage by driving jeeps around area.

Melastoma has been conspicuously ~~the~~ killed distally but sprouting below. Several other shrubs - Geniostoma, Myrtella, Decaspermum etc. show some dead branchlets, but in general there is little effect of the storm. Some of the Casuarinas have broken branches, but generally they show no damage at all, except perhaps some sparseness. Mat of needles beneath, generally well rotted, esp. in somewhat protected spots.

Melastoma has white flowers, subulate to narrowly boat-shaped bracts.

all Dianella seen has white flowers.

Gleichenia is first colonist in some erosion scars, but Stachytarpheta is occasional.

Some fair sized Casuarina, but not very tall, occurrence very patchy.

Plants seen in eroded areas, not in ravine forest.

Timonius glabra  
Lygodium scandens  
Decaspermum fruticosum  
Scaevola  
Gleichenia  
Cheilanthes  
Myrtella  
Wilkestroemia  
Melastoma  
Geniostoma  
Cassytha  
Telaria (Diplazium)  
Casuarina  
Lumniza  
Spathoglottis  
Pouteria ferruginea  
Miscanthus  
Blechnum  
Macharia



Phyllanthus saffordii  
 Diadella ensiformis  
 Chrysopogon aciculatus  
 Flacellaria

Hypoxis capitata

Sporox lithoralis

Stachys phyllanthi

Centella

Waltheria

Lolium

Lycopodium arvense

Nephrolepis

Taxodium seems to be  
 hairy when seedlings and  
 to become less so as it gets  
 older.

Pouteria bushes show  
 every gradation from glabrous  
 to golden sericeous.

Pandanus, large trees,  
 in ravine forest, broken off  
 above root cone, pointing  
 south.

Plants in ravine forest  
 patch

✓ Pandanus tectarius

✓ Cananga odorata

Melastoma

Scaevola

Agave scandens

✓ Pouteria ferruginea

✓ Scleria

✓ Hibiscus tiliaceus

✓ Morinda citrifolia

✓ ~~Can~~ Blechnum

Blechnum

✓ Glochidium marianum

✓ Geniostrum

✓ Freycinetia

✓ Thelypteris

✓ Nephrolepis

✓ Phyllanthus saffordii

✓ Triplaris

Casuarina

Myrtella

Wikstroemia

Cyper

Miscanthus

✓ Premna

✓ Davallia

Hypoxis capitata





Mar. 2 - road up Mimitz Hill  
from Liti - Apra area -

Casuarina 10-15 m. Tall  
lining this rd. show serious  
defoliation - some trees do  
not seem to be putting forth  
any green branchlets at all,  
some are a little green,  
others not seriously damaged.  
Same is true of those on  
road to Alutoma & Tenjo, but  
most of these seem nearly  
or quite dead. This seems  
generally true, but the effects  
are very localized - trees side by  
side show very different  
amounts of damage.

Tips of Miscanthus  
are dry and brown.

Mar. 3 - Tarnaning

Beach in front of Brown  
House has been somewhat  
eroded and of *Thunasia* and  
*Paspalum* & *distichlis* were  
removed about 3 m. - is  
gradually extending out again.  
Limestone tipped over.

Turman Bay - north end  
All large *Pithecollobium*  
uprooted. Some coconut uprooted  
or partly toppled.

Coconut trees mostly  
have a few very short leaves  
now, some old dry ones  
hanging vertically. Were,  
ac. owner, normal leafy trees  
before typhoon. Those close  
to cliff are still in good  
shape. Also a patch just  
back of beach are almost  
normal.

Bet. Fafai and Gogaga beaches  
forest is somewhat battered,  
esp. *Artocarpus* trees. *Pandanus*  
locally dominant, undamaged  
except a few trees uprooted.

Bet. Gogaga & Namu beaches  
forest on the limestone bluffs  
is *Artocarpus*, *Pandanus* (both),  
*Hibiscus*, *Occhroia*, *Hernandia*, *Freziera*.



As usual the *Artocarpus* is most damaged and the *Occhrosia* least. *Hernandia* has small branches nipped back, but is sprouting vigorously. *Pandanus* not much damaged here. This forest rather protected.

Large open flat back of beach here - possibly from sand excavation.

*Bidens leucantha*, *Conyza canadensis* very abundant, also *Paspalum*. ~~Many~~ other plants killed in ~~the~~ The areas with *Bidens* are generally high enough not to have been inundated. The *Paspalum* flats are low and moist. Remains of *Bidens*, *Asclepias*, etc. apparently killed by salt water.

A low beach ridge in front of salt flats has *Ipomoea pes-caprae*, *Thunbergia*, etc. and some very young *Bidens*. Some *Paspalum* here.

Areas of *Scaevola* scrub rather battered.

Gognga Beach has large *Barringtonia*, *Hernandia*, and *Thespesia*, as well as *Coccoloba* and *Pandanus*. These are not battered very much, except that one *Pandanus* is broken off about the root cone. *Hernandia* has lost smallest branches.

At foot of cliff bet. Gognga + Prater beaches are large *Barringtonia*, *Thespesia*, & *Tournefortia*.



green acc. Louder

Plumeria did well

Dalmanis did well

Mangifera (broken but survived)

Royal palm mostly went

Pithecellobium (broken badly)

clump palms went

Calophyllum inophyllum

2/3 of trees uprooted

acc. Louder.

Arumcaria excelsa

larger ones badly broken

Zamia bicolour

Mamillaria fasciculata

Kalanchoe tubiflora

Adiantum trapeziforme

Dianthus caryophyllus

Heterocasia purpurea

Chlorophytum comosum?

Epidendrum (red & orange)

Crossandra undulata

Heliconia (very slender, orange & white)

Dembya spectabilis

Anthurium andersonii

Costus

Euphorbia tirucalli

Dieffenbachia picta

Asparagus sprengeri

Caryota mitis

Lepidium virginicum

Nephrolepis cordifolia

Pilea (large, like microphylla)



Mar 14 - Helicopter trip - 9.00 a.m.

Forest on sw. slope Barrigada Hill battered and defoliated but few trees down.

Coconut plantations sw of Barrigada Hill & n. of Harmon have very few trees down. Patches of forest in this area again in good shape.

Bright green shrubs are myrsinoides.

Forest near Harmon V. is in good shape. But on cliffs sw of it some defoliation & less in Amanto Pt. Coconut plantations below Amanto ~~are~~ are badly battered. Forest in Tamunan, at north end many broken trees, less in central part. ~~Some~~ Some coconuts down near beach, none inland.

Forest at south end below hospital are very defoliated - much more than generally so far, also on top near hospital.

Very good forest on island off Tamuning, not much damage. Cliff road Tamuning is mostly *Leucaena*.

Fort Lave, V. forest badly damaged, trees down, pointing inland. Bluffs & slopes of Summit Hill badly battered.

Much bamboo in ravine in grass area of Nimity Hill. *Casuarina* locally much burned, no pattern.

Mangrove swamps in rather bad shape at head of Apra Harbor.

*Leucaena* looks "crabbed", pointing south and west, around Apra H.

Orote Pen. trees on rocks at tip mostly down. Little damage is. Local defoliation on plateau. *Cycas* enormously abundant. Dominant *Schinus* canopy is opened as now.

Canopy is beginning to regrow, but still completely ineffectual. Apra coverage is freedom. *Cycas* on Orote Pen.

Base of Orote P. is almost all *Leucaena*.



where not open.

Agouti 2-3, up over  
Samlam.

Ravine forest on w. slopes  
not in leaf shade. But  
very local. Many scars,  
but all many of them  
healing. no obvious  
new life on w. slopes.

Some broken trees in the  
ravine, mostly Pandanus.  
Much defoliation esp. on  
upper slope.

Forest on Almagosa and  
Samlam. has larger  
trees very bare. but  
almost none broken.

Ravine forest of Samlam  
on w. slopes shows much  
defoliation, some broken  
trees. Southward along  
Inangan ravine forest looks  
battered.

Mangroves around Thiryo  
untouched.

Photos of Mt. Schroeder.

Coco 9 - Some trees down  
much debris inland as  
Casuarina dry at tips.  
(photos).

No visible effect on Thiryo  
reef. Entire Thiryo area  
lined with low mangrove.

Very little notable  
effect on coastal strip,  
except a few scattered  
down and some browning  
of leaves.

S.S. Collis - not even  
much defoliation on  
dead tips. Water in  
ravine. Forest grass  
not affected.

Browning in ravine  
forest toward ~~Sam~~ Inangan.

A few trees along in  
ravine toward ~~Sam~~ Inangan.  
but Hibiscus forest shows  
little or no effect.  
Inland from ~~Sam~~ Inangan  
much damage and  
corrosion in trees around  
~~Sam~~ Inangan Falls.

Large crown scars  
in San Dae area. Both  
quite active.

Some browning in w.  
esp. Pandanus on  
north part of lake-  
side drainage.

Large trees around  
Talopops Falls shows just  
smaller branches. some  
defoliation, canopy appears  
less on ridge.  
corrosion on top of bar



North end of Talofa  
drainage, has some  
green  
much more battered.

Most trees still have  
North of Talofa V. the  
the main forest is  
grey brown than green,  
but still few trees  
green. Not many  
broken.

On cliffs Mammals  
is low. (Talofa north)  
Back of Toqcha there  
are thousands of small  
trees (Ficus?) even  
all pointing s.w.

Crosses near Yina  
specially have tops.  
Rays near Lenda  
only appearing at tips  
except locally on  
hills just side road  
up to river, where  
quite green.

Bamboo thickets  
up of rays have tangled  
but green.

N. of this 7 or 8 corms  
as seen west of  
but Lenda shows  
only bare tips above  
solid green.

Some broken trees  
in cliff area n. of  
College. but nothing  
like the devastation  
in 1950.

Platan forest with  
along s.e. road shows  
opening of canopy but  
little breakage.

Some small  
northward. No broken  
trees, only partial  
defoliation.

Only a few Platan  
near breakage, some  
Lenda near down.  
(Andersen corner C.)

Broken trees from west  
forest become gray  
northward, E. of  
Bavagada hill.

The canopy left here.  
Around Mabo  
Base many broken trees  
appearing s.w.

N. toward Santa Rosa  
broken less defoliated  
still some breakage  
but dense foresting  
south.

W. of Santa Rosa.  
canopy gone, quite  
few broken trees here  
south. More broken trees



northward all pointing south.

Arroyo. Mont. Arroyo. Lots of broken tree trunks w. & s.w. forest generally esp. down on cliffs and terraces.

Some broken trees s.e. of Santa Rosa but less.

Arroyo loop towards N.W. Field. High Arroyo. Cockscomb down locally. Many broken trees in forest all pointing south.

Forest here locally very battered. Many trees down pointing s. & s.e. Defoliation less than S. of Santa Rosa but still very serious. More trees down here than elsewhere. (in n. part of loop)

Less broken trees but still many S. of Arroyo mostly pointing south.

some toward N.W. F. but less.

In N.W. F. only a few trees down. smaller growth. 'combed' by south.

Plateau border of Ritidian. It has canopy opened, crown all battered, rather few trees down. S. of Ritidian almost no trees down.

Southward become greener, along the side of N.W. F. field, still much defoliation. Smaller veg. 'combed' southward.

S. of N.W. F. a few trees broken, all toward south.

Forest in much better shape around Comuna. Center here defol. a breakage on cliffs. Result of this a little breakage to south but forest is green. Small growth 'combed' to south.

Little breakage south of this toward Town 89.



Leucosoma "Korobed" s.  
s.w. Hammer 7

W. of Nag Agaña  
first large island is  
so green, little patches  
some broken or down the  
steep cliff, point very s.

18. 46.

Nag Agaña  
Central Caroline File.

Eniwetok

10 Jan. 61 8 frames

15 Mar. 61 3 frames

Elato

no date 21 frames

6-5-61

15 March 61 6 frames

Faraulap

no date 3 frames

but rephotograph

Jakerut

no date 4 frames

15 March 61 1 frame

rephotograph, closer.

Igalik

15 March 61 5 frames

Lamotrek

6-5-61 4 frames

15 March 61 3 frames

but rephotograph

Magur

17 March 61 2 frames

Lake Olimarao

no date 6 frames

6/5/61 2 frames

15 March 61 3 frames

rephotograph



Pikelot

no date 5 frames

15 March 61 2 frames

Pisavis

17 March 61 7 frames

Pulap

no date 5 frames

6-5-61 3 frames

17 March 61 3 frames

rephotograph

Puluvu

6-5-61 2 frames

15 March 61 3 frames

and ~~one~~ series marked lateral in lateral photo  
6 frames

Puluvu

no date 17 frames

6-5-61 2 frames

15 March 61 3 frames

~~West Faye~~~~West Faye~~

no date

Ulul

17 March 61 5 frames

Namunika Atoll

mostly poor - rephotograph

West Faye

21 Oct. 54 4 frames

but rephotograph

Woleai

no date 33 frames

no date ones are all  
marked HOG.

rephotograph lateral

Cnds. Asbury



Mar. 3 - Agaña Heights  
planted in garden

- 2 43469 *Jasminum*  
2 70 *Cassia glauca* ~~surattensis~~ *surattensis* Benth. E.  
3 71 *Furcraea*: *spicigera*  
1 +72 *Garcinia mangostana* L.  
1 73 (grass)  
2 74 *Senecio confusus* Britt.  
2 75 *Cydistia*  
2 76 *Gaillardia*  
2 +77 *Crescentia alata* HBK.  
1 +78 *Parkinsonia aculeata* L.  
2 +79 *Cryptostegia grandiflora* (Roxb.) R. & S.  
2 80 *Clerodendrum bungei*  
1 +81 *Guaiacum officinale* L.  
1 +82 *Pittosporum tobira* (Thunb.) Ait.  
3 +83 *Malpighia coccinea* L.

150 m.  
50 m.

- scrambling shrub.  
— shrub 1.5 m. tall, with disagreeable odor when broken; flowers yellow.  
— loosely branched shrub; flowers scarlet.  
— shrub 3 m. tall, sterile; (recovering from typhoon); petioles purple.  
— used in flavoring meat.  
— creeping or scrambling herb, rays orange to scarlet, disk orange.  
— woody vine, with strong garlic odor when broken, flowers lavender.  
— flowers maroon with orange mouths.  
— tree; original ones brought to Guam by Rafford; flowers said to be very ill-scented. "cross tree".  
— small tree; flowers yellow.  
— climber, flowers <sup>sap</sup> lavender.  
— sap milky.  
— leaves maroon-purple beneath, buds white.  
— small tree; sterile.  
— shrub; odor very oily and unpleasant when broken.  
— shrub 1 m. tall, fls. pinkish white.



- 43484 *Jasminum multiflorum*  
 1 85 *Juniperus*  
 3 86 *Lantana sellowiana* Link & Otto  
 2 87 *Lantana camara* f.  
 2 88 *Lantana camara* f.  
 1 89 *Sansevieria*  
 2 90 *Jasminum*  
 4 91 *Thunbergia erecta*  
 2 92 *Jaysia matrella*  
 forming lawn  
 Mar. 3 - Nimitz Hill  
 3 93 *Pinus luchuensis* Mayr  
 single planted tree  
 Mar. 3 - Piti, near  
 old Agriculture Station site  
 4 94 *Eugenia*?

- shrubby, flowers white  
 - fragrant.  
 - glaucous, shrub 2 m. tall  
 - purchased as "prostrata juniper".  
 - depressed aromatic shrub,  
 - flowers purple.  
 - low shrub, flowers  
 white with yellow eye.  
 - fruit lead blue.  
 - ~~low~~ shrub 1 m. tall,  
 - flowers orange turning  
 - scarlet.  
 - leaves erect, mottled;  
 - fruit, with one locule  
 developed, two not.  
 - immature.  
 - semi-scandent;  
 - flowers white.  
 - shrub to 1 m. tall,  
 - corolla tube and throat  
 yellowish, limb deep  
 - purple.  
 - dense mat, rather  
 bumpy.

170 m.

tree 5 m. tall, 2 dm. thick  
 near base. trunk gray-brown,  
 scaly.

20 m.

large old tree, trunk  
 1.5 m. thick; leaves without  
 odor or pellucid dots; sterile.



Mar. 3 - Agaña Heights

43495

*Taeniophyllum*on trunk of crescentia tree  
in gardenMar. 3 - Gognga Beach,  
Tumon Bay

2 + 96

*Stictocardia tiliaefolia*  
common back of beachMar. 3 - Nason Beach,  
Tumon Bay

3

97

*Paspalum setaceum*  
common locally on  
bare coral sand

March 4 - Orote Point

25

+ 98

*Desmanthus virgatus* (L.) Willd  
locally abundant on  
cleared limestone flats

99

*Sporobolus*occasional at edges of  
rough limestone cliffs

50 m.

roots flattened, green.

2 m.

(Desr.) Hall

climbing in trees;  
corolla purple, stamens  
unequal in length,  
anthers white, some-  
what falcate but not  
at all coiled; stigmas  
capitate.

1 m.

depressed tufts,  
culms spreading.

60 m.

suffrutescent herbs  
up to 1.5-2 m. tall; stamens  
white.dense tufts, leaves  
pale, glaucous beneath.



1963 Guam

Mar. 4 -rote Point

High limestone point with a ragged rim. On rim is *Phyllanthus marianus*, and on top of cliff, *Sporobolus* sp. Entire top has been cleared and is overgrown with *Leucaena* except where is grass.

Below cliff is an island with forest that has scrub forest that is brown, probably Mammee.

On a shelf at foot of "Spanish Stairs" has coconut grove. A pond with algae below this.

Mar. 5 - trip to south end of island -

Head of Apra Harbor - the mangrove swamps had some trees still alive but many are down.

Casuarinas around Roxas Village as scarcely damaged.

Hibiscus forest near Agat is a tangled mass with many broken trees.

Agat - fallen trees pointing south. South of this, most are south, but a few point north. Then a number of *Pithecellobium* point west.

Near Fachit. a few casuarinas and *Pandanus* are broken, pointing in various directions. Patches of ravine forest look rather devastated.

Ravine forest in Letti shows little evidence of typhoon.

W. side of Mt. Achroada, grassy above, wooded below - one transverse erosion scar well down on ridge to west.

*Eichhornia* in pool at mouth of Umatac stream flowering abundantly. The clumps



of bamboos are bent down somewhat to westward.

Seedlings on storm beach

- c *Pennisetum*
- c *Thunbergia*
- c *Tournefortia*
- a *Sophora*
- a *Vigna*
- o *Ipomoea tuberosa*
- c, l, a *per-caprae*
- a *Scaevola*
- o, l, c *Lepturus*

Cosco 9.

elevated reef platform just above l.t. or perhaps at l.t. have mats of *Pennisetum*, *Sesuvium* + tufts of *Limnolobos* on a flat, somewhat irregular surface, apparently somewhat abraded, as the pitting is not sharp. (photos here)

Storm beach above the platform has depressed ~~the~~ *Pennisetum* seedlings of *Pennisetum*, *Thunbergia*, *Ipomoea per-caprae*, *Vigna*, *Lepturus*, *Tournefortia*, *Scaevola*, *Sophora*, *Ipomoea tuberosa*, a few *Tournefortia* bushes.

The beach ridge back of this has *Scaevola* scrub badly killed back but abundantly growing from base, a few *Tournefortia* bushes. *Thunbergia* killed back and growing from base, and a sparse stand of *Casuarina* about 4 m tall, upper parts dead, sprouting from lower trunk. A little *Thunbergia* and *Wedelia* at edges of scrub. also some *Lepturus* &



*Sporobolus per-carpus*, but these not old plants.

Inland the *Casuarina* is more abundant, taller less damaged. But where it is sparse, even inland the damage is severe.

Transect into *Scaevola* scrub on cobble or boulder ridge - *Scaevola* slopes up - wind sheared on outer slopes of ridge where there is some sand. *Thunbergia* forms a thin ground layer with occasional *Euphorbia* cham. many *Scaevola* seedlings. *Lepturus* + *Ambristylis* in ~~thinner places~~ <sup>inward</sup> where scrub is 3 m tall there is less sand, boulders larger, less *Thunbergia* more *Euphorbia*, a few scattered other seedlings - *Morinda*, *Hedyotis*, etc. some *Cassytha*, mostly dead.

*Scaevola* gets more or more tangled & taller. Many dead branches but vigorous sprouting. Very matted and tangled inland, more

*Morinda* seedlings, a few *Carica* seedlings. Max. ht. 4 m.

Eastward on reef platform *Peromphila* becomes more abundant, covers greater part of surface except locally locally as much as 3-4 dm. tall, <sup>very locally to 1 m</sup> a few tiny plants of *Lepidolobium distichum* and *Hedyotis albida-punctata* here much less common. *Wedelia* locally at foot of storm beach, also *Lepturus* becomes common on inner parts of platform, esp. where there is some gravel, though this may also accumulate around *Lepturus*.

Near cross channel the beach ridge curves inward, and there is a grove of *Casuarina* in the flat, with *Lepturus* between. Distal 1-2 m of branches of *Casuarina* are dead, none are down. Some *Hedyotis* here, flowering. *Peromphila* generally flowering.



In cross channel are a few *Rhizophora* <sup>& *Barringtonia*</sup> seedlings 0.5-1 m. tall. several wandering tattlers, culls, a dark reef heron, fairy terns.

In outer part of channel *Pemphis* scrub 1-2 m. tall, a very few small *Casuarina*, sprouting only from lower trunk & larger branches. Large *Sesuvium* mats and patches of *Paspalum distichum* on cobbly or sandy places.

(b.w. photos)

In interior of small islet are a number of *Leucaena* 3-5 m. tall, mostly partly broken or down, not flowering, fruiting abundantly. Habitat not quite right for *L. leucocephala*.

Here many coconut trees are down, pointing south, many *Casuarina* either uprooted or broken off 1-3 m. up, pointing in various directions.

Locally  $\frac{1}{3}$  to  $\frac{1}{2}$  the *Casuarina* stand are down.

Lawn of *Blumea* & *Lepturus* cover ground or low scrub, or *Sporobolus* *hesperia* in open places.

Toward east end more *Casuarina* down than standing. *Thesperia* not much damaged, except at tip.

Along lagoon beach many *Casuarina* are uprooted, pointing mostly inland or lagoonward. a few in various directions. Those uprooted are mostly completely dead.

Inland, locally, all trees are down, in other spots few. (photos of place where all are down b.w.) (one b.w. where most are standing - note branchlets along trunk)

*Thesperia* along beach mostly knocked down but still living - yellowish green.

(several b.w. photos)

Larger *Thesperia* still stands but battered (photos) (end both rolls along lagoon beach)



Along lagoon beach  
as a whole many more  
Casuarinas down than  
standing. Few down  
along seaward side.  
Those standing,  
Casuarinas & others,  
very badly battered  
along lagoon beach.

### Sample

- 14 rock from seaward  
reef platform.

Mar. 5 - above Merizo Annex  
photos of Mt. Schroeder  
conservation area from  
Merizo Annex water tank.

Appears to be mostly  
Miscanthus with, perhaps,  
some Pinus on ridge. No Casuarina.

At water tank Gloisogyne  
is colonizing bare soil - tuff-breccia.

A large fire has burned  
over the peak across the  
valley to the right.

Ficus trees are almost  
bare in rain forest.  
Some rain forest  
very brown.

Merizo - Inarajan  
Ipomoea crassicaulis  
established east of Merizo.

Flats toward <sup>Agaña Bay</sup> ~~Inarajan~~  
where brush is cleared  
from under coconuts are  
covered by Wedelia & Pisonia  
peruviana.

Inarajan - Pago  
Bet Tocha & Qlig the Hernandia  
trees have all large branches  
covered with leaves, small



112

1967 Guam

ones are gone.

113



- #3 Mar. 5 - Cocos Island  
 34500 *Leucaena*  
 5 in forest in interior  
 8 01 *Leucaena*  
 common in forest in interior  
 5 02 *Leucaena*  
 common in forest in interior  
 5 03 *Sesuvium portulacastrum* forma  
 common on reef platform  
 at about extreme high tide level  
 3 +04 *Hedyotis albida* - punctata (Mun.)  
 local at inner side of for. reef platform under *Casuarina*

Mar. 5 - Merips Annex,  
 on bare ground near water tanks, decom-  
 posing tuff.

- 3 +05 *Glossogyne tenuifolia* Cass.  
 common  
 1 +06 *Phyllanthus simplex* Retz.  
 rare  
 2 +07 *Emilia sonchifolia* (L.) DC.  
 common  
 2 +08 *Emilia javanica* (Burm. f.) Rob.  
 common  
 5 +09 *Heteropogon contortus* (L.) Beauv.  
 common

1 m.

- tree 6 m. tall, broken off by  
 typhoon, completely dead.  
 slender tree 5 m. tall,  
 flowers white, fruit immature.  
 tree 5 m. tall, blown over  
 by typhoon, immature  
 fruits on sprouts from trunk.  
 prostrate, stems green,  
 leaves subglossy, some-  
 what compressed; flowers  
 pink.  
 plant subfleshy, stems  
 prostrate to ascending,  
 corolla white; fruit green.

90 m.

- stems spreading from  
 a rosette; flowers yellow.

- corollas bright rose pink  
 (this plant looks a bit  
 like a hybrid but probably  
 isn't. corollas are slightly  
 longer than usual, heads  
 larger).  
 flowers brick red.

- tufts; awns twisting  
 when mature.



Mar 6 - arrived 4 p.m.  
n.e. coast opposite Pan American  
area -

White storm beaches  
of pebble gravel, inter-  
tidal beaches of sand and  
gravel.

a series of beach rock -  
an older but poorly  
consolidated intermittent  
strip near low tide,  
being quarried by waves. <sup>(sample)</sup>  
Above this a wide thin  
apparently rather new  
strip (about 8° dip). This  
also being quarried and  
slabs thrown up on storm  
beach. (sample).

around terminal area  
and among houses, on  
leveled compacted soil. <sup>several</sup>  
*Lepturus*, *Triphystylis* <sup>Detfordiana</sup>  
are the commonest plants,  
abundant ~~in~~ ~~the~~ ~~area~~  
~~in~~ ~~the~~ ~~area~~ tiny tufts  
separated from each  
other, and depressed.  
*Lepturus*, scarcely  
fruiting. Small & medium  
*Boerhaavia*. This very limited  
flora is very depressed  
and trampled here.

Mar. 7 - rented car (mileage 49737.4)

Scale 1 - *Lepturus gasparianus*  
common all along road  
as far as bridge.

Base of Flipper Point - a  
dry channel almost  
across the base of the Point  
is washed, in places,  
down to a hard reef platform  
that is somewhat undulating  
on the top surface. Over  
this is a bed that is  
mostly tightly packed  
*Tridacna* shells with  
considerable smaller  
material, esp. the small  
hairy dark colored clam.  
(sample). In with these  
shells are some coral and  
fragments of shells, plus  
very fine silt-like material.  
This not continuous but  
found here and there  
in small bits.

Above the *Tridacna*  
layer is a layer of  
compacted sediments mostly  
a mixture of sand and  
small pebbles, 30-40 cm. thick.  
(sample)

Much of the channel  
bottom is covered by loose



Tridacna shells and reef-rock boulders; in places embedded in sand. The sand is locally much compacted and encrusted on the surface by a layer of blue-green algal crust.

On point side of channel the sandy layer is much thicker.

~~On top of it~~ is the middle of it.  $3\frac{1}{2}$  ft above tide at 11:45 about  $3\frac{1}{2}$  ft. below maximum elevation on Flipper Point is, locally a putty-like bedded layer of clay-like silt, probably held by *Schizothuria* (sample) several cm. thick.

Photos of layers on landward side.

Small *Pisonia* scattered in open ~~lowland~~ *Tournefortia* woodland, flowering locally.

The herbaceous vegetation is mostly dry.

Wake I - near ~~the~~ Japanese Monument - under rocks - beetles, cockroaches, sawflies, isopods, a pseudoscorpion, ants etc. in a concentration. *Amaranthus dubius*. Patches of *Gossypium* scrub

Around old Japanese garden site  
*Cyperus rotundus*  
*Calthanthus*  
*Euphorbia glomerata*



West end of Peale I.  
About 5 acres - having  
been bull dogged and  
leveled.

This has come up to a  
stand of seedlings of  
*Tournefortia* - mostly  
from 5 to 40 cm. high, a  
few scattered ones up to  
1 m. A few patches and  
scattered tufts of *Lepturus*  
or both spp. a few mats  
of *Borhavia* and *Sporobolus*  
tufts, a few *Heliotropium*  
seedlings. (photos)

Also occasional *Portulaca*  
*oleracea* and *Lutea*.

On north side a broad  
storm beach about ~~45~~ 50  
wide of white large round  
coral pebbles, occasional  
*Tridacna* shells.

Diverse population of  
*Lepturus repens*, from a tiny  
compact form with short  
leaves and sessile spikes  
to a much more diffuse  
form with long-pedunculate  
spikes. Also some

Peale I east of Jordan  
Sta. scrub forest or open  
scrub forest of *Tournefortia*  
with patch of *Cyperus*  
*rotundus* and one of  
*Cynodon* in openings.  
A clump of *Vitex* and  
one of *St. Leonardia*.  
Patch of *Paspalum distichum*  
and a large shrub, almost  
15 ft. tall, of *Coccoloba*.  
*Eleusine* very local.  
Ridge occasional.

Peale I - west of bridge on  
north coast -

A very diffuse form  
of *Lepturus repens* is  
common in deep ravine.  
not far from *L. gracilicornis*  
and *L. repens* var. *sept.*

Beachrock exposure  
is wider westward, but  
a very rough dark upper  
layer, then 1 to several  
lower smoother light  
gray layers extending  
much farther landward,  
apparently rather recently  
exposed by high storm  
waves. Is hard to the top,  
at or ab. above high tide. (not  
leveled)



Peale I. - base of  
Flipper Point

sample The Tridacna layer, 18",  
lies on a layer 10" thick of  
sand and gravel, which  
sample lies on a hard irregular  
bedrock surface which  
slopes up from the  
bedrock bottom of the  
channel.

Actually this gives the  
impression of an old  
very gently sloping  
erosion ramp which  
runs along across the  
base of the point. The  
point may well be  
a more recent feature, a  
spit built out at right  
angles to the shore.

## samples

- 15 Tridacna shells from  
deposit on Peale Islet  
at base of Flipper Point.
- 16 Tridacna shell with  
material in which it  
is embedded, layer  
above no. 15
- 17 coral gravel from layer  
below #15, lying on  
bedrock
- 18 silty sand from between  
shells in layer of #15
- 19 bedrock under #17
- 20 compacted dry surface  
~~reef~~ sand in channel  
at base of Flipper Point
- 21 exposed reef-rock in  
channel at base of Flipper Point
- 22 putty-like layer from  
base of Flipper Point.
- 23 small clams from  
Tridacna deposit (#15)



Mar. 7 - Peale Islet, near  
bridge

- 47510 *Lepturus repens* var. *subulatus* Forb.  
common locally in depressions

Mar. 7 ~~Peale~~ Peale Islet,  
Toki Point

in cleared area on coral  
sand and gravel, beginning  
to be revegetated by *Tournefortia*

- 11 *Albugo platensis*  
parasitic on *Boerhaavia repens*

- 5 +12 *Lepturus gasparricensis* Forb.  
common

- 1 +13 *Lepturus repens* var. *septentrionalis* Forb.  
common

Mar. 7 - Peale Islet, near Flipper Point,  
occasional in woodland

- 3 +14 *Pisonia grandis* R.Br.

Mar. 6 - Wake Islet,  
near Terminal Area.

- 1 +15 *Eleusine indica* (L.) Gaertn.  
~~common~~ common on compacted  
trampled soil.

Mar. 7 P. Wake Islet,  
near ~~Japanese~~ monument

- 7 16 *Gossypium*  
forming a loose, open  
scrub

creeping, forming a loose  
mat; spikes ascending.

infected ~~parts~~ stems  
erect, shorter.  
small bunches,  
culms ascending to erect,  
small tufts.

shrub 3 m. tall, flowers  
whitish, very fragrant.

low shrub flowers  
white with five  
dark purple spots in  
center.



- +43517 *Amaranthus viridis* L.  
rare in open ground

Mar. 27 - Wake Islet,  
near old Japanese garden site.

- 1 18 *Boerhaavia*

- 1 +19 *Cordia subcordata* Lam.  
occasional in open scrub

- 5 +20 *Euphorbia glomerifera* (Millsp.) Wheeler  
locally common, sheltered  
places

- 2 +21 *Catharanthus roseus* (L.) G. Don  
persisting locally

Mar. 27 - Wake Islet  
near Japanese monument

- 5 +22 *Cenchrus brownii* (brownii) R. & S.  
rare on disturbed ground

- 5 23 *Puccinia?*  
local, parasitic on *Euphorbia prostrata*

Mar. 8. Wake Islet,  
old TAL compound  
~~persisting from cultivation~~

- 5 +24 *Phyllanthus amarus* Schum. d Thonn.  
very local, but abundant  
where found, around buildings

- 1 25 *Bougainvillea*  
planted around house

stems and leaves light  
green  
shrub 3 m. tall.

woody, erect plants  
to 1 m. tall; ~~flat-topped~~  
involucral glands white,  
flowers magenta.

spreading much-branched  
plant, mature fruits dark  
purple.  
causes normally prostrate  
stems to grow erect.

bracts bright crimson red.



Mar 8 - Wilkes I. Fulmar Pt.

Broad reef flat with a small strip of eroded beach rock and a great boulder field. The boulders notched and many are mushroom-like. A zone about 30 cm. ~~from~~ low tide ~~and~~ high, is conspicuously chewed by fish (sample).

The chewed zone corresponds well to the notch. Parrot fish and others seen biting occasionally, but not very often. Tops of *Portia* colonies are much bitten in the dead parts, and in an inch or so of the living margin, in the "microstol" colonies. The zone of chewing has a small *Ectocarpus*-like brown algae, but this extends a bit higher.

Soft corals of a number of kinds very common, especially near outer edge of reef.

The reef flat has brownish coral growth with channels up to 2 m. deep between masses of coral.

Beach rock sample.

Large group of frigate birds, many males with distended pouches, sitting in *Tournefortia* trees. 3 red-footed boobies, probably young, in nearby tree.

Much *Sida* on Wilkes along road.

In cleared area at end of Wilkes is a <sup>low</sup> vegetation of *Portulaca lutea*, *Lepturus*, *Heliotropium*, *Sida*, *Lepidium*, *Borreria* (2), a few scattered *Tournefortia* bushes (1 m. tall).

The pattern is a mosaic of patches of ~~at least~~ dominant stands of each of them, especially *Sida* and *Portulaca*, and mixtures of any combination of ~~these~~ them. The *Portulaca* and *Heliotropium* reach 0.5 m. or somewhat more. The *Sida* 1.5 m. (orange fls. w. red center). Both species of *Lepturus* are present.

This land has been recently cleared of *Tournefortia* (2-3 years ago?).

Same plants except *Lepidium* found under *Tournefortia*, but not in such numbers.



except where *Tournefortia*  
is open.

Coal Export Corp.  
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Birds - Wilkes ( <sup>flying</sup> )  
2 white-tailed tropic birds (Wilkes)  
3 red-footed boobies (Wilkes)  
sooty terns (large colony on Wilkes)  
common noddies (a number  
on rocks, Kulusu Pt.)

Frigate Birds

1 fairy tern sitting in *Tournefortia*  
2 red-tailed tropic birds (Wilkes, flying)

Red-footed boobies -

about 10-12 pairs nesting  
in *Tournefortia* trees,  
young reaching full size,  
irregularly feathered out,  
possibly some eggs.  
In same trees with  
frigate bird nests.

Frigate Birds - 10-12 pairs  
nesting, eggs and  
almost grown young.  
Males sitting or soaring  
with pouches inflated.  
In same trees with red-footed  
boobies.

Brown booby - 10<sup>+</sup> pairs  
nesting on lagoon side  
of point, just back in  
vegetation <sup>flying</sup> & soaring or  
with wings somewhat feathered  
out. Adult plumage dark  
reddish-sooty brown on back.



at 790 Dosh  
~~Stachytarpheta~~ *Stachytarpheta jamaicensis*  
 abundant  
*Heliotropium ovatum* is  
 still present, <sup>common</sup> ~~very local~~  
*Cnysa bracteata* common  
 other weeds

*Euphorbia glomerifera*  
~~*E. thymifolia*~~  
*E. cyathophora*  
*Fimbristylis cymosa*  
*Cenchrus echinatus*  
*Euphorbia hirta*  
*Pennisetum setosum*  
*Pluchea odorata*

Old 79L Compound  
*Passiflora foetida*  
*Casuarina equisetifolia*  
*Carica papaya*  
*Catharanthus roseus*  
*Ricinus communis*  
*Terminalia catappa*  
*Ficus carica*  
*Crematosia asiatica*  
*Cycas revoluta*  
*Scaevola taccada*  
*Rhoeo spathacea*  
*Kalanchoe pinnata*  
~~*Phyllanthus*~~ <sup>*adiposus*</sup> *undulatus*  
~~*Phyllanthus*~~ <sup>*clavatus*</sup> *oxyperidium*  
*Scaevola guineensis*  
*Bougainvillea*

*Leucaena leucocephala*  
~~*Pandanus*~~  
*Thespesia populnea*  
*Cocos nucifera*

Pond in angle of Runways  
 Vegetation of margins  
 mostly *Sesuvium* with  
 some *Fimbristylis cymosa*  
 and *Lepturus repens*,  
 with scattered shrubs  
 of *Pluchea odorata* on  
 slightly higher ground.  
 Upper slopes weedy, esp.  
 with *Imperata amabilis*.  
 much *Ipomoea tuba*.

1 pintail duck  
 1 flock turnstones 15-20  
 plovers

Around housing  
*Euphorbia tirucalli*  
*Cordia alliodora*  
*Pennisetum acidula*  
*Scaevola taccada*  
*Cocos nucifera*  
*Catharanthus roseus*  
~~*Plumeria*~~ *obtus*

Around terminal  
*Cordia alliodora* (in pots)  
*Cocos nucifera*



Mar. 8 - west end of Wilkes  
Islet, near Kukui Point.

43

in ~~low~~ low vegetation  
on coral sand + gravel flat

+43526

*Lepidium ~~bidentatum~~ mont.*

locally abundant not  
far from beach

5

27

*Boerhavia repens* L.  
abundant

5

+28

*Heliotropium anomalum* H. & A.  
very common

5

+29

*Sida fallax* Walp. - Walp.  
abundant

5

30

*Boerhavia*  
common

1

31

*Albugo*  
common, parasitic on  
*Boerhavia* (#43530)

5

+32

*Portulaca lutea* Sol.  
abundant

5

+33

*Lepturus gasparicensis* Fosc.  
common

5

+34

*Timbristylis cynnosa* R. Br.  
very common

suffrutescent

prostrate <sup>red</sup> stems up to 1 m.

long radiating from root crown;  
leaves pale beneath; flowers pink.

dwarf shrub. stems erect,  
to 50 cm. tall; flowers

leaves  
fleshy;

~~white~~ fragrant, corolla  
deeply lobed, white, with

tiny yellow eye. only one  
kind observed, though

many plants examined.

shrub 1 m. tall; flowers  
clear orange, no red center.

prostrate green stems  
radiating from root crown.

leaves pale beneath; flowers white.

changes habit of plant.

stems erect, very thick.

green, brownish at base,  
flowers yellow, ~~stamens~~

1-2 cm across, petals deeply  
notched; stamens 25-30.

bunches, ~~anthers~~ and  
spikes ascending to erect.

dense tufts



- + 43539 *Lepturus repens* var. *septentrionalis* Fossb.  
common

Wake Islet,  
Mar. 8 - ~~at~~ FAA Dock,  
in weedy ground around  
pier

- 2 + 36 *Coryza canadensis* (L.) Cong.  
occasional  
3 37 *Heliotropium* <sup>ovalifolium</sup> ~~ovatum~~  
common  
3 38 *Pennisetum* <sup>polystachyum</sup> ~~setosum~~ (L.) Schult.  
local (Sw.) L. Rich.

Mar. 9 - Wake Islet, north  
shore, Terminal area

- 2 39 ~~Sphaeralcea~~ <sup>Sphaeralcea</sup> ~~polysiphia~~  
forming a dense ~~felt~~ felt or fur  
on the reef flat which collects  
fine sand.  
2 + 40 *Lepturus repens* var. *septentrionalis* Fossb.  
on gravel flat back of beach

Mar. 5 - Peale Islet, site  
of former Peale Lake

- 2 + 41 *Lepturus repens* var. *septentrionalis* Fossb.  
on disturbed sand and gravel

tufts, spikes ascending &  
spreading, on long peduncles.

flowers white.

erect; flowers white.

erect clumps, fruiting  
almost past.

small tufts.

dense spreading tufts



Mar. 8 - at a very low tide the erosion ramp and part of the reef flat in front of the quarters area, north coast of Wake I. is exposed.

There is scarcely a distinction between the erosion ramp and the reef flat except that the latter is covered by ~~palms~~ <sup>calathea</sup> fern, which may not be able to gain a foothold on the slightly greater slope of the ramp. This is the lowest erosion ramp I have seen - the whole area being almost at base level.

Across it are perpendicular channels about 5-10 cm wide and deep, parallel, running out 40-50' into the reef flat. In the reef flat part these also are lined by ~~palms~~ <sup>calathea</sup> fern, clean in the erosion ramp.

They vary from a few inches to a few feet apart. They seem exactly comparable to the channels seen in other reefs of ferns, Kwajalein, Ulithi (Tracy & Schlanger), etc. but are small and have about cut as deep as they can. Some have gravel in them.

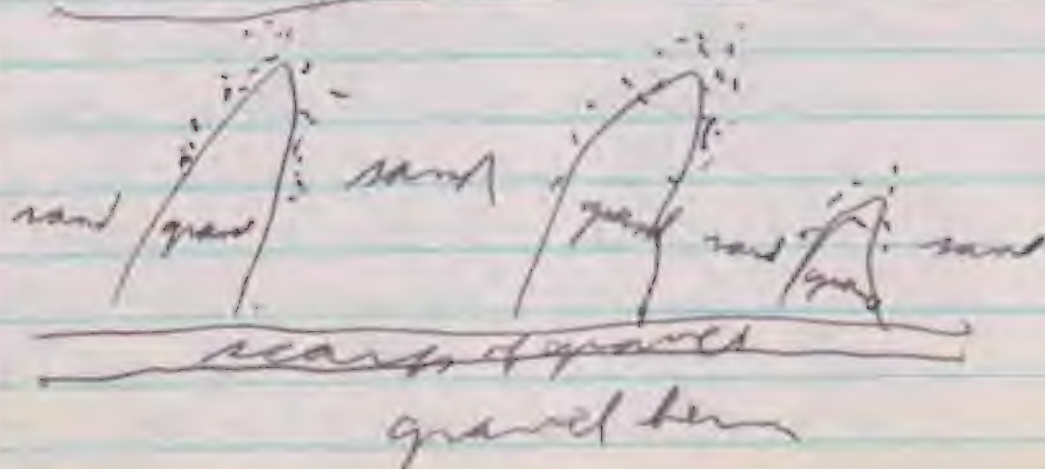
The low exposure of the clean area is remarkably straight for at least several hundred m.

photos and b.w. will be

photos

The beach is cut back into a higher gravel beach, leaving an abrupt scarp. The material of the beach below is fine sand, that of the scarp is small pebble gravel. as is the beach, berm behind it.

At short intervals for a way along this there are masses of pebble material seemingly thrown down on the sand beach, as though a wheel barrow load had been dumped there or some one had pushed down ~~a~~ a section of the scarp, but no section had collapsed. There were a few feet to several yards apart and extended perhaps 2 m. or almost the width of the sand ~~to~~ beach. Alexander suggests cusp formation process, but this seems inadequate.





Mar. 9 Kuku Point

Photos of bite marks on rocks between high and low tides, also of cockroach colony on rock surrounded by water at ~~the~~ high tide. (coll.)

Some photos of area, and also some of *Portia* with bite marks, of soft corals, etc. (end of last roll 4, beginning of 5) (beginning of & w. roll 5)

South shore Wilkes I.  
just west of causeway  
over west channel.

Erosion ramp on old  
beachrocks (photos)  
with small "solution  
pools" (photos)

Surface of ramp at about  
mid-tide is a mottled  
bluish (photos + sample)  
and interior of pools is  
a pink-gray (photos + sample)  
dark gray. (photos + sample)  
Collodium free (Ducos cement)  
of interior of pink pool.  
Photos of foot holes

Three main series  
of beachrock - pools.  
mottled surface in most

seaward, abrasion  
surface sample from  
nest, which is much  
paler gray. Landward  
one is very locally developed  
and not so case hardened.  
(sample) (photo). This is  
mainly conglomeratic

Wake Islet - just east  
of old Suva Main wreck -  
Very wide series of  
beachrock beds, at least  
40 paces wide from inner  
edge to where beachrock  
seems to change almost  
imperceptibly to reef rock.  
All is conglomeratic.

The reef conglomerate (sample)  
is much eroded. The  
actual reef flat is very  
narrow here.

Photos of beachrock, reef  
conglomerate, gravel over-  
lying it, huge boulder  
thrown up (single *Portia* (?) colony)

Tournefortia shrubs killed  
by storm washing over  
gravel.



May 9. Wake Islet, south coast n. of Pearock Pt.

Exposed platform of unbedded rock, pale gray except for dark outer margin. This forms a terrace just above high tide. In this are several areas of beachrock - old & eroded. The whole may be beachrock + coarse conglomerate, bedding very obscured & truncated. May be really platform. (photos. box)

*Heliotropium* dwarf scrub in open areas back of beach between Tournefortia (finished box. roll 5).

Kulua Point - at high tide large parrot fish of several species move around in small schools, several species together, leisurely nipping at coral, making the large marks seen on the rock.

In general the land surface of the island has been almost completely disturbed. In all probability no original vegetation remains, except possibly some *Sesuvium* flats and *Pemphis* scrub along the lagoon margins.

The fact that almost the entire indigenous and spontaneous flora of the island is of an extreme pioneer character causes the secondary vegetation to look rather natural and at least some of the original vegetation types to recur after disturbance.

Of these, a scrub forest of *Tournefortia*, ~~with~~ with or without scattered *Cordia* and *Pisonia*, is the most prevalent. Its stature varies from 2 to about 6 m. and spacing from closed to open. This has little undergrowth when closed, but the branches are very low and spreading and those of adjacent trees are usually tangled together. Where it is open there is an abundant herbaceous to scrubby growth of many species. (old. next 1)



Mar. 9 - Peale I.

Beach rock at about middle of north coast - several beds, partly quarried by waves and pieces thrown up on beach. Compact layer broken off. (photo) Several thin hard layers landward, then a thin poorly consolidated layer most landward of all. Landward layers are white or very pale.

*Tridacna* locality.

ctd. from p. 143

especially *Lida pallax*, *Heliotropium anomalum*, *Pluchea odorata*, and *Lepturus* sp., *Boerhaavia* sp. *Portulaca lutea* is common locally, and even occurs in closed forest, but not in very vigorous condition. Occasional dead branches of larger *Tournefortia* trees, and even a few whole dead trees, recognizable by lack of bark on trunks and larger branches, persist from the 1952 typhoon, but these do not change materially the aspect of the vegetation.



Judging by the stand off *Tournefortia* seedlings on the ~~beach~~ cleared area at the west end of Peale Islet, this type may, under some conditions, reestablish itself immediately after disturbance, without any intervening <sup>successional</sup> stages. Where it does not, as around installations, may possibly be due to compaction, or perhaps to competition with such aggressive pioneers as *Pluchea*, ~~Boerhaavia~~ and even *Cenchrus*, *Eragrostis* and other herbs.

(ctd. on p. 144)



samples - ctd. from #125.

24 sand slightly green from algae, sand flat at about 1-1.5 m. alt., base of Flipper Point, Peale I.

25 beach rock from north coast of Wake Islet west of terminal area.

26 eroded beachrock from same place.

27 reef conglomerate from south coast of Wake Islet e. of wreck of Larva Mam

28 south coast of Wilkes Islet rims of solution pools on erosion ramp at mid-tide level.

29 surface of erosion ramp, same place  
30 abraded surface of old beachrock cuesta, same place, landward.

31 Wilkes I. samples of landward series of beachrock.

32 rock bitten by fish, Kuku Point

33 old beachrock, Kuku Point

34 Peale I. north coast incipient beachrock from landward of several series of old calc hardened beachrock.

35 from under a stone near Japanese monument, Wake Islet

36 on plants

37 clustered on rock that is partly submerged at low tide, swimming easily when brushed into water. (said to be common on rocks in edge of sea elsewhere on island). Kuku Point, Wilkes Islet.



*Pandanus tectorius*

~~same~~ same tree seen in  
1961 + 1963, much larger  
than in 1952.

*Cenchrus brownii*

one plant seen at Japanese  
monument 1963.

*Cenchrus echinatus*

generally distributed in  
open disturbed areas

*Chloris inflata*

still common in disturbed  
areas 1961, 1963.

*Cynodon dactylon*

seen in A99 area 1961,  
one sizeable patch on Peale  
Islet 1963.

*Dactyloctenium aegyptium*

one of the commonest plants  
in disturbed areas, 1963.

*Digitaria ciliaris*

not seen 1961, 1963.

*Digitaria glandichaudii*

not seen 1961, 1963.

*Digitaria insularis*

common  
seen around old Japanese

garden site 1961, also  
seen 1963

*Eleusine indica*

common in disturbed  
places and persisting around  
former disturbances, 1963.

*Eragrostis amabilis*  
generally distributed  
and abundant in open  
places.

*Eragrostis proceroides*  
not seen 1961, 1963.

*Lepturus gasparicensis*

Collected in A99 area 1961,  
abundant generally on  
Wilkes & Peale Islets 1963,  
but rare on Wake.

*Lepturus repens* var. *sept.*  
Common generally

*Lepturus repens* var.

local on Peale Islet near bridge.

*Paspalum auriculatum*

Collected at FAA Dock 1961,  
not seen 1963.

*Paspalum distichum*

several patches on Peale I., 1963



*Pennisetum polystachyum*  
Found sterile at FAA  
Doch 1961, more abundant,  
fertile, at same place 1963.

*Setaria verticillata*  
not seen 1961, 1963.

*Sorghum dochna* var. *technicum*  
not seen 1961, 1963.

*Jea mays*  
not seen 1961, 1963.

*Cyperus rotundus*  
collected in old Japanese  
garden site 1961, seen there  
again 1963, and several  
patches on Peall 7. 1963.

*Cyperus pumilus*  
collected around old Japanese  
garden site 1961, not seen  
1963.

*Fimbristylis cymosa*  
generally distributed, 1963.

*Fimbristylis dichotoma*  
Collected at FAA Doch  
in 1961, not seen 1963.

~~Cocos~~ *Cocos nucifera*  
a number of small trees around

buildings 1963, none  
more than 3 m. tall.

*Caladium* sp.  
not seen 1961, 1963.

*Dieffenbachia* sp.  
not seen 1961, 1963.

*Phyllodendron oxycardium*  
seen in pot 1963.

*Phyllodendron undulatum* (?)  
in pot 1963.

*Raphidophora aurea*  
not seen 1961, 1963.

*Eichhornia crassipes*  
not seen 1961, 1963 has  
undoubtedly disappeared as  
~~the~~ the cistern where it  
grew seems no longer present.

*Rhoeo spathacea*  
seen in pot 1963.

*Heterocallis purpurea*  
seen in pot. 1963.

*Ananas comosus*  
not seen 1961, 1963.



*Cordyline frutescens*  
seen in pots, 1963, not very  
flowering.

*Sansevieria*  
seen in pot, 1963.

*Allium* sp.  
not seen, 1963.

*Crinum* sp.  
planted around buildings,  
not flowering, 1963.

*Hymenocallis littoralis*  
not seen 1961, 1963.

*Casuarina equisetifolia*  
commonly planted around  
buildings, trees have reached  
5 m. tall, 1963.

*Ficus carica*  
still present and fruiting,  
2 m tall, 1963.

*Ficus rubiginosa*  
not seen, 1962, 1963.

*Coccoloba uvifera*  
still present 1961, 1963; on  
Peale Islet a fairly large tree  
in 1963.

*Boerhavia repens*  
Common generally, 1961, 1963,  
in places very abundant.

*Boerhavia* sp. (white fls)  
Common generally, with  
*B. repens*, but less common. 1963

*Boerhavia* sp.  
Occasional, apparently inter-  
mediate between the others.

*Bougainvillea spectabilis*  
seen around houses 1961, 1963.

*Pisonia grandis*  
still formed forest 1961, in  
1963 only scattered trees.

*Amaranthus dubius*  
Found again in 1961, occasional  
locally in 1963.

*Amaranthus gracilis*  
Not seen, 1963.

*Amaranthus tricolor*  
not seen, 1963 (?)

*Amaranthus viridis*  
Collected 1963 (very rare) (1) 43517  
in open ground, Wake Islet.

*Lesqueria portulacastrum*  
Common generally in low



places, especially along lagoon margins and occasionally on flats near outer beaches, M.S. stems unusually red - this true generally.

*Portulaca lutea*

Common, seen 1961, 1963, especially abundant in cleared area on west end of Wilkes Islet. <sup>usually strikingly</sup> long tall form, branches ascending, light green, no trace of anthocyanin.

*Portulaca oleracea*

Seen in 1961, 1963, occasional around buildings and disturbed areas.

*Portulaca ~~sp.~~ samoensis*  
Not seen 1961, 1963.

*Brassica oleracea var. italica*  
Not seen 1961, 1963.

*Lepidium s-waibiense*

Found in 1961, 1963. In 1963 the Lake Peale colony still persists even though the ~~pond~~ pond has been bulldozed out of existence. A large colony just back of beach ~~at~~ at Kulu Point, Wilkes Islet, (1961, 1963).

~~Raphanus~~

*Raphanus sativus*  
Not seen 1961, 1963.

*Lempervivum tectorum*  
Not seen 1961, 1963.

*Kalanchoe pinnata*  
Persisting in IAS compound 1961, 1963.

*Bauhinia* sp.  
Not seen 1961, 1963.

~~Phascolus vulgaris~~  
*Leucaena leucocephala*  
Seen ~~Collected~~ on Peale Islet 1961, well established in same spot 1963, one plant seen also in IAS compound 1963.

*Phascolus vulgaris*  
Not seen 1961, 1963.

*Phascolus* sp. (red fls.)  
One plant <sup>in garden</sup> seen 1961, not seen 1963.

*Codiaeum variegatum*  
Planted around houses, 1963, apparently thriving.

*Euphorbia cyathophora*  
Very common in 1961, perhaps somewhat less so, but still



general in disturbed places, 1963.

*Euphorbia glomerata*

Common, locally abundant, 1961, 1963.  
Reaches a most unusual stature  
and ~~size~~ woodiness here.

*Euphorbia hirta*

Common in recently  
disturbed places, 1961, 1963.

*Euphorbia pulcherrima*

Not seen, 1961, 1963.

*Euphorbia thymifolia*

Collected 1961, not seen 1963.

~~*Phyllanthus amarus*~~

*Pedilanthus tithymaloides*

Collected in IAS compound  
1961, seen there 1963.

*Phyllanthus amarus*

Flourishing colony at IAS  
compound, 1963.

*Tribulus cistoides*

Collected, Wilkes Islet near  
channel, 1961, not seen, though  
searched for, 1963. Three plants  
only seen in 1961.

*Ricinus communis*

Seen planted in IAS compound  
in 1961, persisting and apparently  
thriving in 1963.

*Abutilon album*

Abundant around Japanese  
garden site in 1961, not seen 1963.

*Gossypium*

Widespread, locally common,  
1961 and 1963.

*Hibiscus ornamental hybrid*

Seen in 1961, not in 1963.

*Sida fallax*

Abundant on Wilkes Islet  
1961, 1963, occasional elsewhere.

*Thespesia populnea*

Planted around housing  
areas, and apparently thriving  
in 1963, as well as persisting  
in IAS compound.

*Passiflora* sp.

Not seen 1961, 1963.

*Passiflora foetida* var. *hirsuta*

Established at IAS compound  
1961, still doing well 1963.

Euphorbia thymifolia  
seen in IAS compound  
1963.

From  
p. 155



*Carica papaya*  
Still persisting around  
JAG compound 1961, 1963.

*Cucumis melo*  
Not seen 1961, 1963.

*Cucurbita pepo* ?  
Seen at MTS area 1961,  
not seen 1963.

*Persea acidula*  
Still abundant 1961, 1963,  
especially around lagoon  
shores, planted for hedges  
in housing area, 1963.

*Terminalia catappa*  
Planted in several places  
and thriving 1963, fair sized  
tree at JAG compound 1961, 1963.

*Eucalyptus citriodora*  
Not seen 1961, 1963.

Several cacti seen in pots  
1961, not seen 1963.

*Brassia actinophylla*  
Seen in 1961, not in 1963.

*Polyscias guilfoylei*  
Seen planted near a house, 1963.

*Anethum graveolens*  
Not seen 1961, 1963.

*Apium petroselinum*  
Not seen 1961, 1963.

*Chrysophyllum cainito*  
Not seen 1961, 1963.

*Catharanthus roseus*  
Seen in many places,  
cultivated and established,  
1961, 1963.

~~BB~~ *Nerium* sp.  
Seen 1961, not 1963.

*Plumeria obtusa*  
Planted around building  
1961, 1963.

*Ipomoea batatas*  
Not seen 1961, 1963.

*Ipomoea pes-caprae* sp. *brasiliana*  
Still common 1961, 1963.

*Ipomoea tuba*  
Generally abundant  
except in the most recently  
bulldozed areas, 1961, 1963.  
Flowers open about dusk,  
close mid-morning.



*Cordia subcordata*

Well distributed, locally common in wooded parts of island, 1961, 1963. Forest off this species and *Pisonia* on Wake Islet destroyed 1963.

*Heliotropium anammum*

Common generally, locally abundant, forming pure stands ~~in~~<sup>in open areas</sup> on south coast near Peacock Point, 1963. No floral dimorphism observed. all plants seen here have deeply lobed white corollas with a tiny yellow eye.

*Heliotropium vaticianum*  
(var. *depressum* ?)

First collected 1961 near FAA Dock, still common there 1963.

*Tournefortia argentea*

Generally abundant 1961, 1963.

*Coleus scutellarioides*

Still seen 1961, not seen 1963.

*Stachytarpheta jamaicensis*

First collected at FAA Dock in 1961, much more abundant in 1963.

*Vitex trifolia*

First collected on Peale Islet in 1961. Well established colony in 1963, plants several m tall.

*Capsicum annuum*

Not seen 1961, 1963.

*Capsicum frutescens*

Not seen 1961, 1963.

*Nicotiana glauca*

Seen in 1961, not in 1963, though possibly still persisting.

*Solanum lycopersicum*

Seen in garden in MATS area 1961, not seen 1963.

*Pseuderanthemum canthermii*

Seen in 1961, not in 1963.  
also var. *atropurpureum*.

*Scaevola taccada*

Some plants still remain south of the main runway on Wake Islet, less in 1963 than in 1961, because of bulldozing. also seen planted around house on north side of islet.



*Conyza bonariensis*

Collected in 1961, common  
around old IAG compound and  
FAA Dock in 1963.

*Conyza ~~bonariensis~~ canadensis*

First collected south of  
runway in 1961. common  
around old IAG compound  
in 1963.

*Lactuca sativa*

Not seen, 1961, 1963.

*Pluchea odorata*

Very common to abundant  
in disturbed places ~~and~~  
generally, ~~and~~ seemingly  
more so, especially on  
Wilkes and Peale Islets, in  
1963 than 1961. Dominant  
in shrubby vegetation in  
various places.

*Lonchocarpus*

Not seen 1961, 1963.



*Pisonia* forest, with or without an admixture of *Cordia*, was formerly the most stable and mesophytic vegetation type on the island. The only good area of this remaining in 1953 (also seen in 1961) has been completely destroyed recently by overzealous use of the bulldozer, leaving only bare ground. In a few nearby areas clumps of fair sized *Pisonia* and *Cordia* trees remain and if these could be left undisturbed the *Pisonia* forest so characteristic of coral islands might reestablish itself over a long period of years. ~~It~~ ~~seems~~ That this will be permitted to happen seems improbable, however.

Small areas of *Cordia* scrub near Peacock Point, observed in 1952 have increased in stature somewhat, but are greatly reduced in area.

*Pemphis* scrub still lines portions of the lagoon shore but the area is greatly reduced since 1953

by clearing. Some of them have increased in stature to several m, but are not at all comparable to certain patches of *Pemphis* forest seen in 1952. Next to the *Tournefortia* scrub forest, *Pemphis* scrub is the most prevalent reasonably natural vegetation type now remaining on Wake.

A wide-spread vegetation complex on drier atolls in the central Pacific is a scrub of *Sida fallax* with, normally, a strong admixture of *Lepturus* and, where it is a member of the flora, *Heliotropium arborescens*. This was alluded to but not emphasized or described ~~by~~ on Wake by Bryan in 1933 (*Chrysophanes* 1931) and not noticed at all by Fosberg in 1951-1953 (Fosberg 1959). However, two ~~varieties~~ ~~aspects~~ of this complex ~~are~~ now occupy small areas. On the cleared area at Kuber Point, on the west end of Wilkes Islet, and in the openings in *Tournefortia* forest nearby, *Sida* or *Sida* and *Heliotropium* form an open to closed scrub, with abundant *Lepturus*, *Portulaca lutea*, and



There is much of the cleared area back of Kuba Point given over to herbaceous vegetation, mostly patches dominated by Portulaca, Boerhavia, Scaevola, and in one area Lepidium. The whole forms a mosaic that seems more or less random in its pattern.

Boerhavia where the bushes are ~~seasonably~~ do not form a closed cover. This was doubtless present locally in openings before the clearing which was done prior to 1961. Just west of Peacock Point, back of the south coast of Wake Islet, are openings and thin places in the Tournefortia scrub and sand forest that are occupied by an open to closed dwarf scrub of Heliotropium anammum. This may simply have been missed during earlier visits, or it ~~may~~ may have developed in cleared spots resulting from the 1952 typhoon. This area was not visited in 1953.

Sesuvium flats now occupy perhaps more area than a decade ago, being still present on wet ~~low~~ muddy or sandy lagoon margins and also ~~along~~ coming in where excavation has reached the water table, as in the Grackish pond in the triangle of the ~~runways~~ surrounded by runways

and Taxi strips opposite the terminal building. The plants form a succulent bright green mat in low wet places, ~~but~~ but are more scattered in exposed beach ridge areas ~~elsewhere~~ or other parts of the atoll.

Roadsides and other recently cleared areas are mostly covered by a vegetation of annual grasses and other herbs, especially Cenchrus echinatus, Eragrostis amabilis, Dactyloctenium aegyptium, Eleusine indica, and several Euphorbia species. Such areas, if left ~~without~~ without further disturbance for a while, may change to an open to closed scrub of Blechna odorata. Where traffic is heavy there persists a sparse lawn of dwarfed plants of ~~Dactyloctenium~~ Dactyloctenium, Eleusine, Fimbristylis and ~~other~~ other herbs.

Before ~~the~~ the present visit the weather had been sufficiently dry that much of the herbaceous <sup>wet</sup> vegetation was



practically dry, though by no means as much so as in ~~the~~ May 1952. Many leaves have recently fallen from the Tournefortia, but not so many as to give a dry aspect. The leaves of Cordia and Pisonia are predominantly still green. A few of the Pisonias were coming into flower. Fruits and a few flowers were seen on Cordia.

Evidence of a recent storm, or, at least, of very high waves, were seen on both north and south coasts in the form of large areas of pale gray to white, presumably recently uncovered beachrocks, white stirred up gravel, and dead shrubs at the top of the beach and just back of it. The Airforce officers present said that the period of high waves was in October.

At the base of Flipper Point, opening westward toward the mouth of the lagoon, is a shallow, narrowly triangular inlet, dry at low tide. The landward side of this is lined by a somewhat irregular but not rough erosion ramp, the other side by a gravel and sand beach. The reef platform in which the erosion ramp is cut extends at about high tide level across the head of the inlet, ~~and~~ to and along the other shore of the point. The general level of the surrounding dry land is 1.5 to 2 m. above low tide level.

On the north side of the lower part of the inlet, at the top of the erosion ramp, is a narrow thin beach of sand and shells lying on the upper part of the ramp. At the top of this a small cliff, about 70 cm. high is cut into the bank. This ~~bank~~ cliff exposes a layer, about 50-60 cm. thick of ~~about~~ closely packed Tridacna shells, overlain







by a 10-20 cm. layer of <sup>fine</sup> sand and ~~small~~ gravel, containing a few shells. The lower part of the inlet is completely covered by similar shells, these much blackened. At the extreme head of the inlet is a similar but much thicker tract of shells, not so much blackened. This extends, with some interruption, almost to the opposite shore of the point, and is at least 30 cm. thick in places. Up on top of the bank on the south side of the inlet is another similar tract of *Tridacna* shells. In the material of this bank are also scattered shells.

Nothing similar to this deposit of *Tridacna* was seen anywhere else on the island. The concentration of shells is much greater than occur anywhere ~~else~~ living on the reefs. The occurrence suggests ~~deposits~~ deposits seen in the *Tidamotus* where the clams are an important item of food and the shells accumulate on the lagoon bottom in

shallow water, except that here the layer is at least a meter above low tide level. Wake ~~the~~ never had aboriginal inhabitants, so far as known. The suggestion that the shells may have been from clams eaten by the Japanese soldiers during the war is made less likely by the presence of the layer of sand and gravel overlying the *Tridacna* layer where it is clearly in place.

No artifacts either of aboriginal or Japanese culture were found, and no systematic mode of breakage of the shells, as might ~~have~~ be expected if they had been pried open. However, this species of *Tridacna* is easily opened by cutting the muscle through the hole at the end of the hinge. Since we are not trained archaeologists it is very possible that significant artifacts or other indications may have been overlooked. It would be of great interest to have the locality examined by an archaeologist.



before it is lost to the  
bulldozers.



Man. West Molokai - south coast shallow water is red with mud.

Shallow water along East Molokai coast is slightly muddy, but not red and not nearly as muddy as the west part.

Panai is still red and low. Kaneohe forest is surrounded by wind breakers.

Wooded area on mountain extends well down the slopes into the upper part of the gulches. Shallow water around north coast is red.

Very little mud along West Maui coast. South end grass covered but is rather green, more so than usual. Scattered bachel or Prosopis trees well up the slope.

Pond on S coast of Eithomas has considerable water.

West Maui - Iao Valley

On trail up ridge above lookout is a very good stand of *Rhus javanica*, mostly tall shrubs but reaching 6-8 m. ht. and 10 cm dbh.

Upward a few *Metrosideros* and *Psychotria* (perhaps close to *P. hawaiiensis* as ~~petioles~~ petioles are several cm. long. Lvs strongly obovate cuneate. But thyrse not complex enough for *P. hawaiiensis*. Forest on ridge top becomes less dominated by *Rhus* and more by *Metrosideros mauiensis*.

Ground is covered by a dense layer of *Nephrolepis*, *Microlepia*, occasional *Adiantum*, *Sphenocarpus*, *Oplismenus* covers ground in ~~tiny~~ small openings. Seedlings of *Rhus* common.

No shrub layer except occasional *Guava* and young *Rhus*. *Cordyline* common on slopes, rare on ridge.

Only exotic *Guava*, *Commelina diffusa*, *Paspalum conjugatum*, *Islands gonolobus*.

*P. marianicum*

*Phyllanthus*  
at young plants  
+ 7. *Epithema*



Many good patches of native forest across canyons on lower slopes. Upper slopes and cliffs with thin shrubby vegetation or grass. Some vertical cliffs and vertical valleys really bare.

Beautiful "gumphutheater headed valleys". Waterfalls but mostly dry in fine weather.

No wings whatever on rachis of *Rhus* leaves. Leaves minutely pubescent, young growth red.

Road past Waieae to Kahakuloa - mostly guava scrub and grass. Photos of Pali Kahakuloa, of Pua Koa, and Kahakuloa.

*Artemisia cf. australis* or *mauiensis* on cliff across the bay from Pua Koa. Photo of boulder beach at Kahakuloa.

Kahakuloa - Patch of *Lepechinia hastata* still in good shape, flowering.

Pine planting just below entrance to park has been seriously damaged, apparently by a windstorm, as in area examined about  $\frac{1}{3}$  of trees have been ~~about~~ tipped in one direction, about  $\frac{1}{4}$  completely ~~lost~~ fallen. Of these, some, broken off at root crown, are completely dead. Others, partly still rooted, are still green.

n.e. of Ulumahu,  
Coastal slopes n.e. of Makua  
Open abandoned fields covered by dense growth of *Ryegrass cernuum*, *Paspalum orbiculare*, *Nephrolepis exaltata*, some *Sphenocnemis*, and in thinner places *Centella*, *Pityrogramma*, *Haplophragma*, *Cassia leschenaultiana*, *Cyperus*.

In ravine edges some *Parinari*.  
In ravine wood of *Indium coddianum*, *P. guayana*, with a little *Eugenia caryophyllata*, *bakau*, *Pandanus*.



March 10 - Iao Valley

43542

*Digitaria pruriens*

common in thin scrub forest

March 10 - ~~on~~ southeast of  
Kahakuloa on ~~coastal~~ coastal bluffs.

2 43

*Grevillea banksii*forming a small forest,  
evidently naturalizedMarch 10 - 2 1/2 miles east of  
Kihei

4

44

*Pistia stratiotes*covering the surface of  
water in roadside ditch.March 11 - 2 mi. n. e. Lower  
Paia, Hookipa Park

2

45

*Heliotropium anchusaefolium*

common on low coastal bluffs

5

46

*Lycium carolinianum*locally common on terrace  
above high tide level,  
probably wet by sprayWaihee Valley seems to be one  
of the finest and best disturbed  
on west Maui. Ridges west  
of Waihee show dead trees  
and signs of bog development.Coral reefs developed along  
a coast of S. Molokai - very irregular

500 m.

near Puu Olai

300 m.

small tree or shrub 4 m. tall,  
flowers coral red.

1 m.

lower parts of leaves  
thick and spongy.

10 m.

decumbent; flowers purple.

2 m.

arching dwarf shrub;  
leaves fleshy; flowers  
lavender, corolla limb  
patent; fruit scarlet, fleshy.broad fringing reef  
Lower slopes of all ridges  
grassy with some brush -  
perhaps lower 2/3. Ravine  
bottoms wooded. Kawa forest  
extends some distance inland  
back of Kaunakakai. Mangrove  
fringe west for several miles west  
from Kaunakakai.green forest  
along coast  
area -  
mangrove?



Ideas for investigation  
of revegetation - volcanic  
materials:

Long term program of  
observation - cooperative bet.  
NPS, Jap Amer. Corp, USGS + PSB,  
and Univ of Haw.

To be initiated on Jap Amer.  
Corp funds, with under-  
standing that, if these fail,  
continuing observations will  
be carried on by NPS + UofH.

Personnel - Univ. Inv.

autecologist

synecologist

2 assistants

ecologist-geomorphologist, volcan-  
ologist

Areas of investigation -

Hawaii Volcanoes Nat. Park & vic.

Haleakala Nat Park

Lassen Nat Park

Crater Lake Nat Park

Craters of the Moon Nat Park

Katmai Volcano.

Investigations to be initiated  
in fields of autecology,  
synecology, dynamics.  
All of these to be related  
to geomorphology.

Autecology - marked  
plants to be ~~of~~ examined,  
measured, and measurements  
repeated at intervals to get

rates of growth and  
annual or seasonal increments.  
Ratios of shoot & root  
dry weight for principal  
species to be determined.  
Using growth increments,  
and this ratio, rough  
net productivity to be  
determined.

~~Phytosociological~~  
Phytosociological investi-  
gation - apply B-B or similar  
system using complete  
floristic relevés.

Measurements of environ-  
mental factors - soil moisture,  
insolation, drainage,  
depth & texture of soil,  
organic matter, exchangeable  
bases, pH, etc.

Dynamic - permanent  
plots and transects to be  
established, photo point  
to be established, observation  
made seasonally and  
at regular intervals.

Population dynamics of  
complex genera.  
Invasion behavior of exotics







Mar. 13 - Honolulu

University Campus

43547 *Wedelia trilobata*  
 2 planted as ornamental  
 ground cover

48 *Jatropha g. hastata* *integerrima* Jacq.  
 2 plant as an ornamental

Mar. 19 - 2 miles north of  
 Turlock, Stanislaus Co. Calif.  
 in weedy area in orchard

3 49 *Claytonia perfoliata*  
 common

1 50 *Lamium amplexicaule*  
 occasional

~~51 *Lonicera japonica*~~

2 51 *Armsinckia*  
 abundant; has in  
 recent years become one  
 of the most abundant  
 weeds in the region, formerly  
 common only locally.

3 52 (Conf.)  
 very abundant in old barnyard.

1 53 *Lonicera japonica*  
 planted many years  
 ago in yard, has not  
 spread but is a healthy plant.

prostrate, flowers yellow,  
 mostly not flowering  
 at this season.

shrub 2.5 m. tall;  
 flowers bright rose-  
 crimson. late, almost  
 clear, not abundant.

35 m.

flowers pinkish white.  
 (probably not native here  
 but naturalized from  
 plants brought into  
 garden many years ago  
 from coastal California)  
 corollas purple.

erect, corollas orange

tangled climber, sterile  
 at this season.



Mar. 19 - 10 miles ~~west~~ <sup>west</sup> of  
Modesto, on Mader Ranch,  
east of San Joaquin River.  
in shallow very alkaline  
depression in pasture.

- 43554 *Erodium*  
abundant around edges of
- 2 55 *Plantago*  
locally abundant
- 3 56 *Allocaena*  
locally abundant
- 1 57 *Orthocarpus*  
occasional, more  
abundant in slightly  
higher spots.
- 1 58 *Allium?*  
occasional
- 1 59 *Brodiaea capitata*  
occasional
- 1 60 *Senecio*  
occasional in edges of
- 3 61 *Lepidium*  
locally abundant
- 5 62 *Baeria*  
abundant, forming  
masses of color.
- 1 63 (cich.)  
rare

25 mi.

flowers purple; fruits  
conspicuously erect.  
rather fleshy

prostrate, flowers  
white to bluish white.  
corolla tube white, gales  
reddish, lower lip, sulphur  
yellow.

crushed stems have a  
rather disgusting odor,  
not quite like garlic;  
flowers white.  
flowers violet

disk yellow.

flowers bright deep chrome  
yellow.



Mar. 19 - ~~2 1/2~~ 1 mile n.w. of <sup>25 m.</sup>  
 Vernalis, west of San Joaquin River  
 in weedy railroad  
 right-of-way

43564 *Amsinckia*  
 6 common

2 65 *Allocazys?*  
 occasional

5 66 *Lepidium*  
 common to abundant

6 67 (bray.)  
 locally abundant

Mar. 19 - 3 1/2 mile n.w. of  
 Vernalis, west of San Joaquin River <sup>25 m.</sup>  
 in weedy railroad right-of-way

6 68 *Amsinckia*  
 locally abundant

5 69 *Amsinckia*  
 locally abundant

5 70 *Amsinckia*  
 locally common, with  
 nos. 43568 and 43569

flowers orange

stems spreading,  
 almost prostrate,  
 flowers white.

erect, flowers white.

flowers showy, orange.

flowers yellow &

flowers orange



March 19 - Maper Ranch, 11 miles west of Modesto -

An alkaline depression or vernal pool in a pasture is marked, at this season, by masses of *Bacris* that show up as solid leafy brown yellow irregular patches. The vegetation of the pasture surrounding the depression is dominated by *Erodium* sp. but has considerable grass and various other species.

The depression, itself, is a mosaic of vegetation with patches of bare soil encrusted with white alkali. *Bacris*, *Plantago*, *Allocaena*, and *Lepidium* form pure or almost pure patches, as well as mixtures. The plants collected were only the obvious species. The *Victoriaceae* plant ~~is~~ is a rare one that was collected by accident, mixed with the *Bacris*. *Suaeda* is common.

This area is north of and immediately adjacent to the Maze Road, just east of Maper Ranch Gate No. 2. Its area must be at least 4-5 acres, possibly more. It is quite irregular and

in the time available could not be thoroughly looked over - some extension westward was noted and doubtless there are other such areas.

For Conservancy purposes someone should go down there and look it over at leisure - preferably now while the plants are still in flower. A wide survey of the general area should be made as possibly there are much better sites than this.

The area is presently grazed, but apparently not too heavily, at least at the moment.

Later

Land near the River on both sides and to Tracy has fine black soil. Is doubtless drained till marsh.

Could it be that this is more subject to alkalization by irrigation than sandy areas farther away from river?

Could it be that "black alkali" ~~(Na<sub>2</sub>SO<sub>4</sub>)~~ (Na<sub>2</sub>SO<sub>4</sub>) is result of reaction with H<sub>2</sub>S by NaClO<sub>3</sub> ~~and~~ in these marsh soils & subsequent oxidation?



Mar 20 - flight S.F. to Wash.  
 The Sierras south of Mono Lake present a tremendous rugged field of peaks, much more impressive than to the north. Mono Lake is still a large lake, but Owens Lake is much smaller. Mt. Shasta is visible in the far distance, very white. The higher peaks of the Sierras, esp. those to the south, have considerable snow, but at middle to fairly high it appears to be very light.

The Nevada ~~and~~ mountain ranges, especially southern Nevada, have snow down almost to the base, even the small clumps of hills. This becomes less eastward, where only the higher ranges show any snow.

Several dry lakes in eastern Nevada and perhaps western Utah - one at least has considerable water right now. Could be a permanent lake - Carson Sink?? ~~Carson Sink~~

45 miles out of S.F.)

Several black spots may be low flows.

Snow becomes more abundant eastward, but at higher altitudes only. Many snow-covered ranges visible to north, not many to south. Just north & northwest of Grand Junction Colo. is an extraordinary arrangement of canyons, tributary to the Upper Colorado River. This is cut like a maze, into a sedimentary block and all of the canyons finally converge and the outlet is through a narrow portal. Deserves further exploration - first on topo-maps, then on the ground.

The country west of the Mississippi, from 33000' looks generally a dull brown. Little green shows except rarely where there is an irrigated field in the desert.

As the Mississippi is approached, a black color becomes more prevalent, representing forested or bushy areas.











198

200





10-6

Wake Island 3/9/63 1962

STATEMENT OF SUBSISTENCE, QUARTERS  
AND LAUNDRY SERVICE FEES DUE

TO: DR. F. R. POSBERG

ORG: Official Expense Federal Aviation Agency  
Domestic Services Section, Wake Island

For meals and lodging furnished on the dates specified below:

March 6, 1963	:	Dinner	\$	2.00
March 7 thru 9, 1963:	3 days @ \$6.50		19.50	
March 10, 1963	:	Brkfst	<u>1.00</u>	
			\$22.50	

ONE DAY'S CHARGES CONSISTS OF THE FOLLO:

BRKFST	\$1.00
LUNCH	1.25
DINNER	2.00
LODGING	<u>2.25</u>
	\$6.50

*pd  
3.9.63*

Payable in cash or by check to order of FEDERAL AVIATION AGENCY.  
Make payment at Island Manager's Office, Second Floor, Terminal Building.

*25/20.75  
15*



38  
10/10/10



